Author's Toolkit

Reprints of Ron Read's columns in IEICE Information and Systems Society Journal
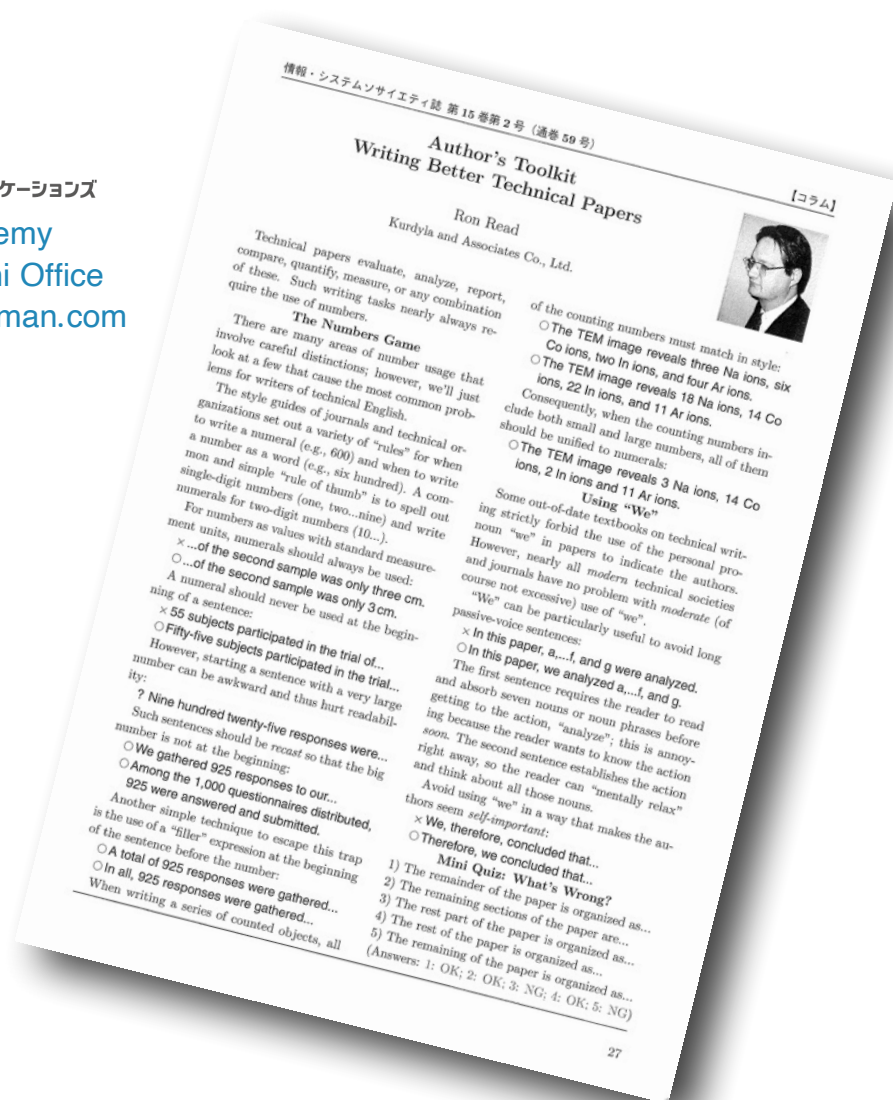
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Author's Toolkit

Writing Better Technical Papers
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Several years ago I touched on how *overly tentative* expressions can weaken technical writing. Here, we return to this persistent issue from a few different viewpoints.

Restrain the Urge to Hedge

In various cultures, ideas are often advanced in a way that indirectly suggests uncertainty or a reluctance to be firm in statements. In social communications, this may smooth out feelings or avoid an arrogant image, but in technical writing, such uncertainty may raise questions about the work's worth or even validity.

Consider these two expressions:

✘ We are now working to develop a new…
○ We are now developing a new…

The first example sounds weaker because everyone know development requires some effort; moreover, it raises the possibility of failure.

Other phrases are simply unnecessary:

✘ We may say that our metric better reflects…
✘ It can be said that our metric better reflects…
○ Our metric better reflects…

Although the author may assume that the first two examples start with a strong, positive tone, such starts to a claim actually weaken the impact and credibility of the claim.

Even when an idea must, by its nature, be expressed tentatively, authors often add an *extra*, unneeded layer of uncertainty. This typically occurs with verbs like "suggest":

✘ Our findings suggest it might be possible to…
○ Our findings suggest it is possible to…

Unlike verbs such as "show" or "demonstrate," "suggest" inherently conveys a sense of not being certain. This "built-in" tentative nature also applies to nouns like "candidate":

✘ This material might be considered a candidate for replacing the previous…
✘ This material is a possible candidate for replacing the previous…
○ This material is a candidate for replacing…

Or for some adjectives like "promising":

✘ Automatic alignment of MT outputs might be a promising approach to achieving better…
○ Automatic alignment of MT outputs is a promising approach to achieving better…
○ Automatic alignment of MT outputs might very well achieve better…

"Promising" only offers an optimistic view, it does not state a promise that must be kept.

At the end of a paper, authors frequently preview the next possible step as "future work"; this too is not a promise that must be kept:

✘ Future work could include expanding the…
○ Future work includes expanding the…

No one is really going to remember these possible tasks and check that you do them. And researchers can certainly change their plans.

If you can state something definitely, do so!

Limit "the" in Functional Text

Some text in your paper performs a structural function, such as section titles and figure captions. These are written in a "tighter" style than your body, or paragraph, text. A key feature of this style is avoiding or limiting use of the word "the." Consider this section title:

✘ The Analysis of Orbital Deviation
○ Analysis of Orbital Deviation

Deleting "The" gives the title more clarity, readability, and impact, thus improving the paper. The same effect can be seen in figure captions, especially at their beginning:

✘ The SEM images of samples A–D in a…
○ SEM images of samples A–D in a…

Again, without "The" we have punchier text.

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Mini Quiz: What's Wrong?

1) …when using the method by Chen et al.[18]
2) …when using the method of Chen et al.[18]
3) …when using the method from Chen et al.[18]

(Answers: 1) NG, odd-sounding; 2) OK; 3) OK, but only to indicate specific citation/paper)

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In technical writing, comparing different things, actions, or qualities is a common task. To compare clearly and correctly, you need to understand what you are actually comparing.

Comparing with Precision

Most comparisons made in a technical paper are fairly straightforward, easy to write and easy to understand:

○ The synthesized material is several times more conductive than base metals.

○ Automatic categorization performed only slightly faster than the conventional method.

However, sometimes we're not directly comparing things but some *attribute* of those things, which requires special expressions:

✗ The temperature dependence of our method is 23% lower than the conventional method.

○ The temperature dependence of our method is 23% lower *than that of* the conventional method.

It's easy to see the problem with the first example: We are not comparing "temperature dependence" with a "method." In the second example, we properly use the pronoun "that" to represent "temperature dependence" while also keeping the expression non-repetitive.

This handy writing tool for comparisons also has a plural version:

○ User surveys conducted in summer have a higher response rate than those in winter.

In some cases, writers use "than that of" incorrectly, or at least unnecessarily:

✗ The problem of delayed activation, in some cases, is worse than that of failed activation.

This is a subtle distinction, but in this context, we know that "failed activation" is itself a problem, so saying "the problem of failed activation" is logically possible but in a real-world sense clearly redundant. We just mean:

○ The problem of delayed activation, in some cases, is worse than failed activation.

This revision is clearly a "problem-to-problem" comparison, and the sentence has more impact. But if you want to avoid such subtleties, you can of course just recast the sentence:

○ In some cases, a delayed activation is a more serious problem than a failed activation.

When you have a long series of attribute comparisons, such as reporting results, it's usually acceptable to neglect the verbal references to the attributes after the precise comparison has been once established:

○ Most noticeably, the frog cue had a 33.4% higher recognition accuracy than that of the bird cue; furthermore, snake was higher than mouse, dog was higher than kangaroo, and cat was the second-highest visual cue.

When making a comparison, always keep in mind what is being compared to what.

Don't Use Ghost Numbers

In your paper's Discussion or Conclusion, it's often useful to focus on a limited number of findings, advantages, problems, etc.:

○ Our experimental results identified three key advantages to our method. First…

A problem *may* arise when you get to that second advantage:

± Second, our method was able to…

This may be fine if it comes only a few sentences after the first advantage. But I've seen many cases where it's written a large paragraph or more away. In this case, readers are likely to forget what "Second" refers to. Remind them:

○ As its second advantage, our method was…

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Mini Quiz: What's Wrong?

1) Thus, we identified that agents may also be…
2) Thus, we knew that agents may also be…
3) Thus, we found that agents may also be…
(Answers: 1) & 2) NG, odd-sounding before a clause expressing a discovery; 3) OK, natural)

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Achieving a sentence that clearly expresses your intention is a worthy goal. One basic pattern toward this end is a short passive clause in the past tense followed by an infinitive phrase.

Passive + Infinitive for Intentionality

Sentences can often be *recast*, or structurally rearranged, in different ways to best express the intended meaning or to satisfy a writing style requirement of the publisher.

One such requirement is a publication's rule against using "We." (As mentioned before, most academic publishers have no problem with "we," but some cling to this old prohibition.) Thus, these clear and simple sentences are forbidden:

- ✗ We generated a higher response by setting a lower threshold.
- ✗ We set a lower threshold to generate a higher response.

A basic solution is to simply recast the sentence using a passive voice construction:

- ± A higher response was generated by setting a lower threshold.
- ± By setting a lower threshold, a higher response was generated.

These sentences are quite clear, yet the authors' intentionality looks somehow concealed. To express *purpose* even with a passive sentence, an infinitive phrase ("to" form) can be handy:

- ○ A lower threshold was set *to generate* a higher response.

Although this sentence is not really any clearer or better structured than the above two sentences, it more strongly emphasizes the authors' intentionality in performing an action toward a particular target.

In using an infinitive phrase, placing it after, rather than before, the passive voice clause creates a slightly higher sense of the authors' intentionality:

- ○ To prevent breakage when the robot moves through narrow passages, a more flexible sensor mount was designed.
- ± A more flexible sensor mount was designed to prevent breakage when the robot moves through narrow passages.

The difference between the nuances of these two sentences is nearly imperceptible, but a native-English reader will surely perceive the first one's greater intentionality of action.

This easy pattern for stressing your intention is a useful addition to your writing toolkit.

Writing *Highlights* or *Contributions*

In recent years, many journals have requested a section for showing a paper's "highlights" or "contributions." These are usually placed, as lists of sentences or just phrases, after the abstract.

They are typically short (25 or 30 words) and formatted as bulleted (•) or numbered (1, 2, 3...) points, with usually three to five of them.

In addition to normal good writing principles (clarity, high impact), pay attention to using consistent sentence style among the points:

- ✗ 1) A new judgment criterion is established...
  2) Computer simulations are run to test the...
  3) We also verified the simulation results by...
- ○ 3) Experiments are conducted to verify...

When discussing your achieved results or performance levels, state these achievements in specific rather than general terms:

- ✗ • Very large improvement in noise cancelation was achieved by...
- ○ • A 17% improvement in noise cancelation was achieved by...

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Mini-Quiz: What's Wrong?

1) Many reports have proven the feasibility of...
2) Many reports have proved the feasibility of...
(Answers: 1) OK; 2) OK; Both are considered correct as present perfect forms, although several top American and British sources (Chicago, AP manuals of style) prefer "proved")

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As I've often noted, English is an action-oriented language, which makes verbs particularly important. Consequently, you should carefully choose the sentence's verb.

High-Impact Verbs

In many cases, different verbs can be used to reflect your intended meaning in a sentence. In technical writing, the chosen verb should not only clearly convey this meaning but also express the appropriate *impact*.

For example, to show the main cause of some effect, consider the following two sentences:

✕ The material's strength is *decided* by the cooling time.

○ The material's strength is *determined* by the cooling time.

The first sentence sounds weaker, and it's a bit odd because *people* usually "decide" things.

Another writing job is to express the level of performance reached by a proposed method. Here, you should choose a strong verb:

✕ By applying our model, we *realized* more than 20% improvement in precision.

○ By applying our model, we *achieved* more than 20% improvement in precision.

Here, "realize" does not strongly express a significant achievement—"achieve" does.

When you want to say that your purpose is to understand something better, consider the effect of these two verbs:

✕ Our aim was to *better understand* the causes of the recurrent pattern shifting.

○ Our aim was to *clarify* the causes of the recurrent pattern shifting.

Although both of these sentences basically give the same idea, the second one gives the added impression of *actively* investigating the issue rather than just passively receiving information from the results.

When describing future work, such as at the end of a paper's Conclusion, the means of reaching a research aim is often still not clearly defined, and in fact this search for a good method may be at the heart of that anticipated study:

✕ In future work, we will *study* ways to minimize the latency in robot responses.

○ In future work, we will *explore* ways to minimize the latency in robot responses.

These two sentences both clearly give the intended idea. But the second one's use of "explore" has the added feeling of aspiration and excitement, rather than just continuing work.

In presenting results, consider impact:

✕ These results *show* substantial improvement in the detection of anomalies.

○ These results *demonstrate* substantial improvement in the detection of anomalies.

Here, "demonstrate" is stronger and more concrete, but don't use this strength needlessly:

✕ These results demonstrate only minor improvement in the detection of anomalies.

Poster Backgrounds

Recently, I've been carefully examining the conference posters of my students as well as a large number of posters from various websites.

A common design weakness is the background used, especially that of the text sections. Too often, I see "artistic" backgrounds such as images or textured patterns that hurt the readability of the text, thus burdening visitors trying to get the ideas quickly and easily.

Keep text blocks simple: dark text against a plain, light-colored background. Always think about your visitors' comfort in getting the info.

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Mini Quiz: What's Wrong?

1) We adapted a new model to handle the...
2) We slightly adopted the model to handle the...
3) We adopted a standard model to handle the...
(Answers: 1) "adopted"; 2) "adapted"; 3) OK, or "adapted" depending on the context)

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About a year and a half ago, I discussed dealing with the need, due to the pandemic, to sometimes present online. After doing this a lot since then, let me briefly update my ideas.

Online Presentations Revisited

First, I *really* prefer presenting 'face-to-face' rather than online, although others have the opposite preference. Still, many organizations have recognized the clear advantages of online presentations: inviting participants regardless of location, saving transportation time and costs, and better accommodating tight schedules.

So regardless of the public health situation, it seems like the online revolution is here to stay.

Previously, I mentioned the powerful tool Open Broadcast Software (OBS) for creating a very customized screen image. Although this is great software, I now recommend keeping your computer setup as simple as possible, especially if someone else (e.g., conference organizer) controls the network. But OBS could be ideal in recording video for archives or YouTube.

Another idea I mentioned was attaching a ¥100 mirror to your webcam with a rubber band to avoid a non-intuitive reverse-mirror image of yourself. But a bigger advantage of this is to orient your eyes toward the webcam, replicating 'live' eye contact with the audience; too often I see online presenters who look like nerds doing computer work while talking to themselves.

How you look on the screens of your audience may largely be out of your control, since viewers can minimize your image to a tiny box. If you're using a recent version of PowerPoint or Keynote, you can put your live video image, via your webcam, right into a slide with the Cameo or Live Video feature, respectively. This is great for adding emphasis and audience contact.

A good use of a Cameo-like 'visit' by the presenter is a 'breather' slide between major parts of your presentation, when you take a moment to calmly summarize the last few slides of the presentation and set up what's coming next. These allow the viewer to breath and relax between parts that are dense with info.

Along those lines, mix up slides showing text or tables with slides showing simplified graphics or photos, with only a few words. As in any presentation, your main job is not to convey information but to build interest in the work.

Finally, invest a few thousand yen in a moderately priced clip-on mic. This provides much better audio quality—and thus listener experience—than your computer's built-in mic.

Machine-Assisted Writing

The recent development of AI technologies like ChatGPT is raising much excitement. I'm often asked about using applications for checking over English text. Such systems can be useful, and they've improved greatly. However, can they really be trusted for final checking of text?

Such blind trust is still not warranted. Highly technical fields often use expressions differently from ordinary language, which could cause misinference and thus bad output.

Furthermore, these systems are aimed at native-English speakers able to understand complex suggestions in English. If you do not understand a system's suggestion, do **not** take it, since faulty input can 'snowball' into confusion.

I suppose I'm biased as a human editor. But humans still write, or present, for other humans, and a *human touch* thus remains valuable.

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Mini Quiz: What's Wrong?

1) First, we conducted a pre-evaluation to find...
2) Finally, we conducted a post-evaluation to...
3) ...conducted a pre-trial evaluation to...
(Answers: 1) NG; 2) NG; 3) OK, the same principle applies to "post-trial evaluation")

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One of the most common writing functions in a technical paper or presentation is to tell what action you've taken and the reason for taking it.

Actions and Reasons

Similar to the job of expressing cause and effect, discussed in an earlier column, stating an action and its reason requires clarity to convey this basic but important relationship.

The simplest case of this writing job is a single action and a single reason:

- ○ A new simulation was designed to achieve a better balance of parameters.
- ○ To achieve a better balance of parameters, a new simulation was designed.

This is also an easy task with a single action and multiple reasons:

- ○ A new simulation was designed to better balance parameters and reduce computation.

Or with a single reason and multiple actions:

- ○ To better balance the parameters, a new simulation was designed and additional experiments were carried out.

However, things get messier when writers attach an action to reasons at *different logical levels*. Let me explain with an example:

- ? To achieve a better balance of parameters, a new simulation was designed to incorporate the recent findings of Cooper et al.

Here, the action of "design" is done for two reasons, "to achieve" and "to incorporate," but unlike the multi-reason sentence above, these two reasons are not parallel:

- ✘ A new simulation was designed to better balance parameters and to incorporate the…

Although the above sentence is grammatical (and in a *certain sense* "true"), the reasons function in different logical ways: "to achieve" is the overall purpose of the new design, while "to incorporate" shows how the new design was made. So having the action *sandwiched* by two "to" reason phrases of different logical levels can disrupt readability by making the reader mentally untangle the logic of how each reason differently relates to the same action. Therefore, such sentences should be limited to a single "to" phrase:

- ○ To achieve a better balance of parameters, a new simulation design incorporating the recent findings of Cooper et al. was adopted.
- ○ To achieve a better balance of parameters, we designed a new simulation by incorporating the recent findings of Cooper et al.

Of course if the second "to" serves a different function than purpose, this is not an issue:

- ○ To better balance the parameters, a new simulation design was applied to our model.

As in almost all writing jobs, remember that a simple sentence structure and a clear chain of logic provide the highest readability.

Whose Paper?

Previously, I warned about using "the authors" in an ambiguous way: Do you mean *yourselves*, the authors of the *current paper*, or authors of a paper just cited before this sentence?

A similar confusion is risked by "this paper":

- ? …as demonstrated by Alba et al.[5] This paper showed a new approach to evaluating…

Often the position in the paper or the sentence's context clarifies the meaning of "this." But if you're not sure, play it safe:

- ○ …as demonstrated by Alba et al.[5] *That* paper showed a new approach to evaluating…
- ○ …as demonstrated by Alba et al.[5] *Our* paper showed a new approach to evaluating…

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Mini Quiz: What's Wrong?

1) However, the proposed approach does not…
2) However, the proposal approach does not…
3) However, the proposal's approach does not…
(Answers: 1) Good; 2) NG; 3) OK, but usually not as good as 1))

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Every sentence conveys at least one idea. Sometimes it includes different aspects of an idea or even multiple ideas. In such cases, consider the order of these parts.

Order of Ideas inside Sentences

The sequence of presenting ideas is an important factor in improving the readability of any text, whether it's a story, a business report, or an academic paper.

Here, the best guide is to use the order that requires the least thinking—don't make your readers think about your words, let them think about your ideas.

Normally, we expect the first noun we encounter to be the subject of the sentence, the doer or receiver of *the action*:

- ✘ In a carefully prepared Pb-lined vacuum chamber, the target was irradiated by X-rays.
- ◯ The target was irradiated by X-rays in a carefully prepared Pb-lined vacuum chamber.

In the first sentence, we must read through a description of secondary information on the environment to get to the main idea; in the second sentence, this main idea is immediate.

On the other hand, if such secondary info completes a transition from the previous sentence, then there is a natural flow of thought:

- ◯ A Pb-lined vacuum chamber was carefully prepared for the experiment. In this chamber, X-rays were irradiated to the target.

Another common type of sentence where the main action may be best positioned later is a conditional *if/then* statement:

- ✘ A longer cooling time is recommended if the temperature peak exceeds 180°C.
- ◯ If the temperature peak exceeds 180°C, a longer cooling time is recommended.

Although both sentences are easy to understand, the second has better readability because the critical condition comes first.

In compound sentences with two clauses, the choice of which to put first is often obvious:

- ✘ The user knows that input is permitted, and first a haptic signal is given by the system.
- ◯ A haptic signal is given by the system, and then the user knows that input is permitted.

But in other cases, this choice depends on the writer's intention and the immediate context:

- ◯ The robot must be robust to blunt force, but a flexible robot body is also advantageous.
- ◯ A flexible robot body is advantageous, but the robot must also be robust to blunt force.

The first sentence introduces a discussion on making more flexible robots, while the second emphasizes the constraint of robustness.

'See-Cue' – Four Abstract Criteria

Recently, I've been giving online seminars on abstract writing to researchers and university students.

Largely through responding to questions, I've developed a simple four-point guideline, or criteria, for writing a good abstract: CCUE, or as I call it, 'see-cue.' This stands for *clear*, *comprehensive*, *useful*, and *engaging*.

The abstract must first be clear so that readers have no problem understanding the message. A comprehensive abstract has all of the essentials: what was done, how it was done, what was found, and what those findings mean. A useful abstract tells the reader what the paper covers, and even whether it concerns his or her interests.

At a more sophisticated level, an engaging abstract motivates the reader to keep reading the paper. This quality is what we strive to give our clients in their documents.

Want an online seminar on abstract writing?
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Mini Quiz: What's Wrong?

1) The lens is focused during measuring the…
2) The lens is focused while measuring the…
3) The lens is focused during measurement of…
(Answers: 1) NG; 2) OK; 3) OK)

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All serious pursuits—building construction, interface design, document writing—depend to some degree on established rules. But some rules are more breakable than others.

Breaking Rules

In the writing arts, such as long-form fiction, journalism, and technical writing, a variety of rules should at least be heeded and in most cases followed. We nearly always respect basic rules of English grammar, such as verb agreement:

✘ These phenomena was observed when…
○ These phenomena were observed when…

Furthermore, established rules are also applied in higher-level choices of language use. One such rule is to avoid weak "helping verb + noun" constructions in favor of "action verbs":

✘ In future work, we will conduct a more precise evaluation of the inter-node communication.
○ In future work, we will more precisely evaluate the inter-node communication.

Using action verbs in this way not only makes sentences more concise but also gives them greater impact. I teach this principle in my own writing seminars, and suggestions to follow it are also given by MS Word's "Editor" function and such stand-alone programs as Grammarly.

However, such "rules" or principles are not absolute. In some cases, breaking the rule could be the best choice:

✘ We carefully prepared for the volatility of incoming unfiltered signals.
○ We made careful preparations for the volatility of incoming unfiltered signals.

Here, the author places greater stress on the noun because he or she will describe those preparations in detail.

Similarly:

✘ Manufacturers must act concretely to…
○ Manufacturers must take concrete actions to reduce use of rare-earth minerals in their…

Since the author will continue by giving more details of the actions to take, the noun form is more natural for continuing the discussion.

You must actively decide whether the suggested revisions of editing software are suitable for the desired message. Don't agree to such changes automatically and passively.

e.g. & i.e. Revisited: Usage

Several years ago in this space I touched upon the use of e.g. and i.e., very useful abbreviations in technical writing. I had mentioned that they have distinct meanings (e.g. is "for example"; i.e. is "that is") and punctuation (American: follow with a comma; British: no comma).

Another issue involves the type of context in a paper where their use is appropriate. They add efficiency and clarity to sentences in such technical sections as Methods or Results:

○ The process also evaluates audio variables, e.g., pitch, duration, and timbre.
○ The process evaluates two audio variables, i.e., pitch and duration.

However, in sections giving more general descriptions, like Introduction or Discussion, their use may seem odd in certain sentences:

✘ Some countries, e.g., Iceland or South Korea, have taken a different approach to…
✘ However, the main problem, i.e., transparency, remains unresolved in their solution.
○ Some countries, for example, Iceland or South Korea, have taken a different…
○ However, the main problem, that is, transparency, remains unresolved in…

Writing out the full words in the above conversational contexts sounds more natural.

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Mini Quiz: What's Wrong?

1) Regarding to the second trial's results, it is…
2) Regarding of the second trial's results, it is…
3) Regarding the second trial's results, it is…
(Answers: 1) NG; 2) NG; 3) OK)

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Questions are at the root of the Socratic method and central to technical discussions. But do they have a place in a technical paper?

May I ask a question?

Essentially, a technical paper is expository, that is, it presents and explains methods, results, problems and solutions. Therefore, the question form is not the main communication tool in a paper, and it is much less used than in, for example, a small seminar's lecture.

However, questions should not be entirely banished from your author's toolkit.

A key use of questions in a paper is to describe research challenges that must be met to accomplish your research goals and thus develop your method, system or device.

○ Several issues must be resolved toward achieving this goal:
- What are the optimal sensing parameters for a mobile interactive guide robot?
- What body form is most user friendly?
- How much autonomy is appropriate?

In the above introduction to research issues, the questions are effective in the manner of a rhetorical question asked by a presenter (by the way, often an effective presentation technique): they make the readers *think* about the issues.

On the other hand, questions should not be carelessly deployed when a simple indicative sentence is clearer and less awkward:

✘ However, we must also consider this: How will users respond to such natural interaction?
○ However, we must also consider how users will respond to such natural interaction.

As in an oral presentation, excessive use of a question, or any communication tool, becomes tedious and distracting. A little of a good thing goes a long way.

How about using a question as the title of a paper? We sometimes see this style in large-circulation journals/magazines to raise reader interest and add some pizzazz:

○ Adapting Interactive Robots to the Tasks of a Hotel Concierge.
+/- Interactive Robots: Working as Tomorrow's Hotel Concierges?

But many editors, particularly at highly specialized academic journals, will not care for such a breezy approach to titles.

Use the power of questions strategically.

Author Bios

A very standard section of a journal paper is the authors' biographies, or personal histories. These are short summaries of each author's career and research interests.

Usually, the journal to which you're submitting your work will have at least basic guidelines on how to prepare the bio, its suggested length, and technical details like the dimensions/resolution of your photo ('headshot'). But there are some universal principles to keep in mind when preparing your authors' bios.

Avoid the common problem of unnecessary use of "respectively" in educational background:

✘ She earned her bachelor's and master's degrees in Engineering from Kyoto University in 2007 and 2009, respectively.

In describing research interests, don't go into excessive detail, but don't be too general either:

✘ His interests include information science…
○ His interests include multilingual inference…

Try to make the size, style, and contents of the co-authors' bios roughly uniform. For your own 'branding,' consider using your photo from SNS platforms, which should be smiling!

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Mini Quiz: What's Wrong?

1) …used the Birnbaum theorem to obtain…
2) …used Birnbaum's theorem to obtain…
3) …used the Birnbaum's theorem to obtain…
(Answers: 1) OK; 2) OK; 3) NG)

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The colon is one of the lesser-used marks of punctuation, but if used skillfully, it can make a sentence short and clear.

The Colon: A Fine Introducer

The most common use of a colon in text is to introduce information that gives clarification, parts, examples, or consequences of the info stated in the first part of a sentence:

- ○ Our process is applied in three stages: detection, discrimination, and analysis.

Of course other ways can be used to introduce such completing information:

- ✗ Our process is applied in three stages, including detection, discrimination, and analysis.
- ○ Our process is applied in three stages, consisting of detection, discrimination, and analysis.
- ○ Our process is applied in the three stages of detection, discrimination, and analysis.

The first example is a common writing problem that can mislead readers into thinking there are other stages; the other two examples are fine but use more words.

As for capitalization after a colon, if the content forms an independent sentence, it can be *either* capitalized *or* lower-case. If the content includes just phrases, as shown in the above "stages" example, it is *not* capitalized.

In technical writing, a very common error is to use a colon to introduce an equation when it flows as a normal part of the sentence:

- ✗ ...and then Eq. 3 can be simplified as:
  $$\text{⊙} \times (\text{▱}/\text{☺}) = \text{⊙} \times (\text{▱}/\text{☹}) . \qquad (4)$$
- ○ ...and then Eq. 3 can be simplified as
  $$\text{⊙} \times (\text{▱}/\text{☺}) = \text{⊙} \times (\text{▱}/\text{☹}) . \qquad (4)$$

But it's OK to use a colon when restating, *not continuing*, an idea in a sentence:

- ○ ...and thus Eq. 3 can be simplified:
  $$\text{⊙} \times (\text{▱}/\text{☺}) = \text{⊙} \times (\text{▱}/\text{☹}) . \qquad (4)$$

This is an important distinction to learn.

Invented Terminology: Intro It Carefully

When I first started as a technical rewriter in Japan more than 30 years ago, many of our clients were engaged in cutting-edge technology: machine language translation, functional polymers, advanced robotics, etc.

Some of the work being done by Japanese corporate/academic labs required the creation of whole new concepts that had not yet been named in English. So Japanese researchers, as authors, had to *invent* new terms. Some of these invented names were intuitively clear, others confusing.

Let me suggest a simple three-step pattern to introduce original terms for your concept. After extensively searching the literature to ensure that a suitable term doesn't already exist, first use quotation marks in the abstract to smoothly introduce the term:

- ○ ...and this failure is attributed to a 'memory collapse threshold.'

Here, do not give further explanation—using the term appropriately in the context is sufficient for now. Second, use the term one more time with quotation marks in the Introduction:

- ○ ...and such a cognitive disruption can lead to reaching a 'memory collapse threshold.'

Finally, as the third step, immediately give a very concise definition of your term:

- ○ In this work, we define a memory collapse threshold as the point at which...

Then the term can be used without quotation marks, although doing this one more time early in the Discussion or Conclusion is a good idea.

Need your paper revised?
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Mini Quiz: What's Wrong?

1) They provided us revised data for...
2) They provided us with revised data for...
3) They provided revised data to us for...
(Answers: 1) Conversational style, especially U.S. English, not proper for writing; 2) & 3) OK)

Author's Toolkit

Writing Better Technical Papers
Ron Read
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A while ago, I wrote about stating opposing ideas, a central writing task in science. Here, we return to this task with an emphasis on the order of the opposing ideas within a sentence.

Ordering Opposing Ideas in Sentences

When stating two "sides" of an issue within the same sentence, it's important that both positions are independently simple and clear and, moreover, that the opposing relationship between them is obvious.

Another aspect is deciding which position to state before the other. For example, you could write the following idea in either of two ways:

○ Despite the wide range of SNS platforms available, most users restrict their regular use to one or two of them.

○ Most users restrict their regular use of SNS to one or two platforms, despite the wide range of available platforms.

Both of these sentences are clear and highly readable. But do they say the same thing? The choice of which to use depends on the context within the passage, the author's purpose, the overall 'atmosphere' of the text, etc.

Personally, I would probably go with the first sentence—it nicely 'sets the stage' with the first statement and then delivers the key message in the second statement. The second sentence is fine, but it places less emphasis on "wide range."

The immediately previous sentence will often determine the logical and natural order of ideas:

○ …drastically decreased precision. Although this can be a serious problem, our approach reduces its impact on the final estimation.

✗ …drastically decreased precision. Our approach reduces this problem's impact on the final estimation, although it can be a serious problem.

The second sentence is just too 'jumpy' in expressing the 'major conflict.' When 'although' appears in the middle of a sentence, it generally introduces a 'minor conflict' to the solution:

○ Our method can dramatically decrease computational load, although a small amount of calibration is required in advance.

Reversing the order of those two statements is clear, but the opposite order ("Although a small…") somewhat weakens the main thrust. As another example, here's a nice stage-setting sentence that's clear and even strong:

○ Regardless of the size of the training dataset, the proposed algorithm is extremely quick.

But the reverse is even stronger:

○ The proposed algorithm is extremely quick, regardless of the size of the training dataset.

The point is not which one's better but to consciously think about which order of opposing ideas you want to use in this part of your paper.

Outlining: An Essential Stage

Recently, I was discussing 'the planning of writing' with some Osaka businesspeople. The lively talk reminded me that many of our clients, as technical writers, seem to give little attention to planning a document before writing the draft.

A tool used by every professional writer is the *outline*, which maps out hierarchies and sequences of sections, points, examples, and graphics. Although you can buy outlining software, all you really need is paper and pencil.

Moving or modifying the pieces of your document in outline form is much quicker, easier, and structurally stronger than moving around chunks of drafted text. The time you invest in building a strong outline will bring returns of much less time and frustration in drafting.

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Mini Quiz: What's Wrong?

1) They investigated into the problem of…
2) They investigated the problem of…
3) … an investigation into the problem of…
(Answers: 1) NG; 2)&3) OK)

Author's Toolkit

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Through the second summer of the pandemic, conferences and seminars are still held online. Those who have given online presentations know that special techniques are needed.

Presenting Online

People who normally fear 'live' audiences might feel a little relief at presenting online; however, I find it disconcerting to see my audience only as small rectangles containing names, images, or sometimes video.

Both giving and getting information individually in a small room greatly differ from participating communally in a lecture hall.

For display on small screens, preparation of your slides requires even more simplicity, visual attractiveness, and explanatory power than usual. Excessive text and detail in slides will hurt, not help, your presentation.

Construct different versions of your slide deck. First, along with the basics, include fine detail, informative notes, reference citations, secondary graphics, etc. This forms the 'support document' provided to audience members for reading *after* the presentation (*not* before).

Next, copy that version as your 'presentation slide deck' and delete roughly 40–80% of the slides' content. Only show your online audience graphics and a few words that support what you're explaining. Keep visuals simple!

Don't neglect the preparation basics for online presenting: Have on hand a full bottle of water, throat candy, pens & paper, notes and materials for answering questions. Turn off applications not used and keep open windows to a minimum.

For best visual effect, do *not* use screen mirroring; however, seeing yourself in the software's screen may confuse your hand-gesturing and head movements. Place a small mirror just above your webcam to view yourself.

Consider 'sharing' an entire second monitor rather than simply the presentation slides. This can let you 'frame' your own video near your slides and add other helpful visuals. Consider using Open Broadcaster Software (OBS), which is free and not difficult to learn—this gives you much more power over what your audience sees.

Online presentations typically take a bit more time. Be prepared to skip over slides, telling your audience they'll get the info later, rather than incoherently rushing through slides. And practice. Being very familiar with your own slides will produce a better audience experience.

Dead-End Abstracts

A paper's abstract is an immensely important document—it introduces the paper's work to the journal's editors and reviewers and then after publication (ideally) to the paper's readers.

The final part of the abstract should be "*the Significance*"—what the paper contributes to the field and to the world. Sadly, many abstracts simply finish by reporting major results:

✘ In the third experiment, synonym-matching improved to an accuracy of 87.3.

The reader is left wondering why he or she should read the paper. What is important? It's a bit better to end showing context in the field:

+/- … an improvement of more than 4 points over the current state-of-the-art system.

But even better is to end with a statement of the general advance presented in the paper:

○ Consequently, the proposed system can provide much more natural and true-to-original translations without additional processing time or computational overhead.

End your abstract with a vision, not just data.

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Mini Quiz: What's Wrong?

1) …was conducted with monitoring the rise in…
2) …was conducted while monitoring the rise in…
3) …was conducted by monitoring the rise in…
(Answers: 1) NG; 2)&3) OK, different meanings)

Author's Toolkit

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Merriam-Webster and dictionary.com, among other reference works, give surprisingly lengthy definitions of that small but ubiquitous word "of," a preposition that has amazing superpowers.

It's the Power of "Of"

It's difficult to imagine writing a paragraph of technical English, or even a long sentence, without using "of" at least once. Fundamentally, it is a connector used to show a basic relationship, but its uses are quite versatile.

One of the key techniques of writing more concise and clearer text is to reduce the use of "of," typically with a possessive form:

- ✗ …and the amplitude of the signal was then…
- ○ …and the signal's amplitude was then…

This technique is especially important when there is a chain of multiple "of" parts:

- ✗ The dependence of the velocity of the robot on its maximum stride length is…
- ○ The dependence of the robot's velocity on…

However, being overly zealous in your efforts to reduce the use of "of" can result in expressions that less directly give the intended meaning:

- ✗ The robot's velocity dependence on…

In some cases, "of" gives an expression an expected and time-tested emotional power:

- ○ The spirit of innovation is a critical factor in…
- ✗ Innovation's spirit is a critical factor in…

Here, "the spirit of…" is an idiomatic unit that immediately and naturally evokes a very deep belief and corresponding behavior. (Amazingly, in a client's document, I recently encountered the "correction" of the former into the latter by commercial "grammar-checking" software!)

With other idiomatic expressions, removing "of" would result in an absurd sentence:

- ○ …have provided a wealth of knowledge for…
- ✗ …have provided knowledge's wealth for…

In some cases, a modifier introduced by "of" can provide a powerful statement of what is most important in a sentence:

- ○ This is an issue of immense importance.
- ✗ This is an issue that is immensely important.
- ✗ This issue is immensely important.
- ✗ This issue has immense importance.

Although all of the above sentences are very clear and easily readable, the first "of" version conveys the meaning with much more impact. In other cases, an equivalent sentence without "of" would be nonsensical or silly sounding:

- ○ …is a matter of utmost importance.
- ✗ …is an utmostly important matter.

Expressions with "of" often have an important relationship to definite article "the":

- ○ One of the proposed solutions was to…
- ✗ One of proposed solutions was to…
- ○ One proposed solution was to…

(Third sentence can have a different nuance.)

Repeating methods with only slight change

A very common approach to setting up studies is to run multi-trial experiments, where only a few variables change. In such cases, it can be more effective to focus on the difference rather than just *nearly* repeating an earlier description:

- ○ Experiment 1 used 15 male subjects who…
- ✗ Experiment 2 used 15 female subjects who…
- ○ Experiment 2 was conducted under the same conditions as Exp. 1 except for using female rather than male participants.

Here, the reader clearly sees the point of variation in experimental design, whereas a simple listing of conditions, one more time, may hide the key difference from a sleepy reader. This approach is even more effective when reinforced with a table of experimental conditions.

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Mini Quiz: What's Wrong?

1) …based on Jergin's book entitled *New Views…*
2) …based on Jergin's book titled *New Views…*
3) Readers are entitled to a clear description of…
(Answers: 1) Wrong; 2) & 3) OK)

Author's Toolkit

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As I tell the participants at my one-day or half-day technical writing seminars, if you have not thoroughly proofread your document, you have not fulfilled your responsibility as a writer. But first I ask, "What is *proofreading?*"

Proofreading Effectively

Many people seem to understand the concept, but from the sea of downcast eyes, they feel uncomfortable explaining it in English. Answers I typically get include "checking" and "reading again," both of which are highly relevant but neglect the purpose: *confirming correctness.*

In reality, proofreading by a researcher almost always crosses the boundary into the territory of revision, which is almost always a good thing.

But proofreading's fundamental job is catching and repairing errors, in most cases very small spelling or grammar errors:

- ✘ **It's** effectiveness can be demonstrated by…
- ✘ Our approach is based on the **principal** of…
- ✘ However, **there** method did not consider…
- ✘ The results **form** the second trial **conform**…

Sometimes the errors to catch are not related to English usage but caused by *mistakes of fact.* It's not unusual for humans to "think backwards" between their brain and typing fingers. As a rewriter, I can only catch such mistakes by understanding the sentence's context:

- ✘ …and then the light intensity **decreased**.
- ○ …and then the light intensity increased.
- ✘ The same effect was observed **with** the…
- ○ The same effect was observed without the…

There's a variety of other types of errors that proofreading must find, such as now incorrect figure numbers from older versions of the paper.

So how should the careful writer proofread? In two ways: reading (much) more slowly than usual and reading more quickly than usual.

The slow proof is reading sentences word by word, often re-reading the same words a few times before moving on. This is certainly not the way we usually read, either for work or pleasure. But it must be done to recognize, for example, that we don't mean "It is" but "Its," or not "there" but possessive "their."

A fast proof is needed to see the "big picture": How do the major ideas flow through the writing? Are transitions clear? Is enough and clear background given to concepts? Have you properly "balanced" the paper's elements? Are you using the optimal sequence of sections?

Between the micro-level slow proofing and macro-level fast proofing you should of course proof the work a few times at a normal pace.

Briefly, a few other pointers: Return to the document with a fresh mind, after sleeping, eating, taking a walk. Get extra sets of eyes on your draft: preferably readers familiar *and* unfamiliar with your studies. Certainly use but do *not* depend on spelling/grammar checkers—although they've vastly improved over the years, the final responsibility lies with you.

As mentioned, in the real world of researchers working as writers, proofreading often leads to revisions that strengthen and improve a paper.

And then check again…

After a major revision, due to responses to editors or referees, addition of new data, or suggestions by colleagues, proofread the entire paper again, or at least the major section involved, not just the altered sentences. What seem like small changes often have an unexpected way of touching, like ripples from a stone thrown in a pond, other areas of the paper.

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Mini Quiz: What's Wrong?

1) Furthermore, it's robust against leakage of…
2) Furthermore, it's robust to leakage of…
3) Furthermore, it's robust for leakage of…
(Answers: 1) & 2) Both OK 3) wrong)

Author's Toolkit

Writing Better Technical Papers
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A technical paper typically raises a problem, reviews related past works, makes assumptions, investigates solutions, and then reaches a finding. But if the finding is not expressed consistently, its impact may be weakened.

Keeping the Message Consistent

Authors of technical papers ultimately make an *argument* for an approach to solving a problem, understanding natural phenomena, or improving a process. Ideally, the authors should express this argument in a single clear sentence:

○ The proposed system allows the operator to seamlessly switch between automatic signal detection and manual signal search.

Such an "argument sentence" typically appears first at the end of the abstract. But it's of course repeated throughout the paper: at the end of the introduction, in a summary of results, and at the finish of the discussion or conclusion.

A problem arises, however, when the argument sentence loses focus or clarity by being expressed too differently at the various positions (**Px**) where it appears in the paper:

P1 [*above sentence*]

P2 The process of determining a signal source is greatly simplified and made much easier.

P3 Selecting the preferred operational mode can be done without complicated recalibration.

P4 The key advantages of both automatic and manual signal-finding can be leveraged.

While all four of the above sentences may give important ideas that should be expressed somewhere in the paper, they are too different to express a single, high-impact argument.

The main reason for this kind of unhelpful variation is the authors being overly concerned about repetition of phrases in the paper.

Authors must realize that promoting a clear and unified argument is much more important than concerns about "originality." It's OK to make only slight variations:

P2 Our system permits seamless switching between automatic and manual signal-finding.

Even a word-for-word repetition of this key sentence in different positions of the paper is fine. Above all, the argument must be clear!

Result or Results?

The *product* of a research report is basically its results: new data and thus knowledge coming from experiments, simulations, or observations. I recently received an interesting question from a client about the word "result" itself, specifically why I had changed his sentence (modified here for confidentiality) from

✗ …measured light intensity at intervals of 5 sec, and the result is given in Fig. 7.

to

○ …measured light intensity at intervals of 5 sec, and the results are given in Fig. 7.

This type of singular "result" has often been used by my Japanese clients, so I replied with my own question: Why do you write "result"?

His answer was interesting. He said his meaning of "result" was the general tendency of light intensity to increase with time. Ah, I see! But the logic generally used here is that the expression refers to the plural results of *all* values or data points represented in the figure.

However, when you explicitly refer to a single observation from the figure's data, you certainly use the singular "result":

○ Our result of an increasing tendency (Fig. 7) is consistent with the finding of Rivera et al.

In deciding between "result" and "results," consider what you actually want to indicate.

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Mini Quiz: What's Wrong?

1) A very huge difference was observed in…
2) … reliable even at very extreme temperatures.
3) …at a very high rate of transmission.
(Answers: 1) & 2) Delete "very"; 3) OK)

Author's Toolkit

Writing Better Technical Papers
Ron Read
Human Global Communications Co., Ltd.
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During the coronavirus pandemic, many of us have begun working from home as a public health precaution. When your work involves writing, it may be a challenge to stay productive.

Writing in "lockdown"

If you're used to doing your writing jobs in an office, a faculty room, or another professional setting, working at home during the day will likely seem strange, and you might be concerned about remaining focused and productive.

One key factor affecting writing is the aural ambience, or what you hear as you write. For example, writing near a construction site or loud, joking coworkers isn't so pleasant.

Some writing authorities have suggested playing BGM, or background music that's usually "softened" jazz, classical or pop music. Personally, after an hour or so, this becomes annoying to me—it all becomes the same.

On the other hand, music that you really enjoy, whether classical 70s rock or John Coltrane, will probably be distractive because it will put you in a "time-off" mood for enjoyment or relaxing.

A compromise might be music that's both intellectually stimulating *and* suitable for taking a secondary place in your consciousness. For this, I like Ryuichi Sakamoto or Philip Glass.

Some people may have the discipline to write in "library silence," but that too is uncomfortable for many of us less disciplined writers. One alternative is an environment with pleasant natural "white noise": wind, waves, rain. If these aren't available where you write, check YouTube!

Another factor is other people: your spouse, kids, parents, neighbors. They must realize that, although "at home," you are not "on vacation."

People you work with may also contact you by email/texting or phone calls more than they talk with you in the office or at school. If this becomes disruptive to your writing work, it may be useful to inform them what times of the day are best to contact you (early morning, after lunch, etc.).

Being out of a normal work environment and away from colleagues can also create an unreal sense of time. For example, I find myself getting "trapped" in Google searches while reading about my clients' research fields. As always, make and stick to time-marked writing goals!

Potentially tricky...

The word "potential" indicates something that can be reasonably expected to exist or occur in the future. In technical writing, this is usually used in a positive way to promote an approach:

○ This method has much potential as a speedy, non-contact testing protocol.

But it can also show a negative possibility:

○ Installing this battery near a heat source creates a potential fire or explosion hazard.

The most common problem non-native English speakers have with "potential" is simply placing it before a noun in a vague way:

✕ ...and it is a potential refraction analysis.

This seems oddly incomplete—normally in such a sentence we would expect "potential" to modify a word that in turn modifies the noun:

○ ...and it is a potentially effective and low-cost refraction analysis.

Another use of "potential" is to indicate a *new competitor*, using a word like "alternative":

○ ...and it is a potential alternative to conventional refraction analysis.

A similar word is "promising," but using this requires more confidence in the idea's potential!

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Mini Quiz: What's Wrong?

1) Now, many staff members work at home.
2) Now, many staff members work from home.
3) Now, many staff members do home work.
(Answers: 1) OK; 2) OK, and gives further nuance of a temporary measure; 3) Unnatural, and sounds like academic "homework")

Author's Toolkit

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Opposition, conflict, contrast, difference are all inherent forces in our universe. And in technical writing, they play a major role in describing new research and developments.

No, *this*, not that...

When we want to show a difference between multiple things, situations or ideas, the usual fallback words are "but" and "however":

○ RIGO-2 showed better overall performance, *but* it still has rather low dependability.

○ RIGO-2 showed better overall performance; *however,* it still lacks sufficient dependability.

However, there are many other words/phrases that can describe opposing ideas:

○ RIGO-2 showed better overall performance. *On the other hand,* its dependability is still too low for practical application.

Some indicators of opposition convey a special nuance of the opposing idea. The underused "nevertheless" tends to introduce a *more* important or influential point:

○ The transmitted signal strength was marginally below that of the conventional system. Nevertheless, it was still robust enough for our purposes.

Conversely, the very handy "although" tends to introduce a *less* important or influential point, despite whether it introduces a clause at the beginning or middle of a sentence:

○ Although the transmitted signal strength was marginally below that of the conventional system, it was still robust enough for our purposes.

○ The transmitted signal strength was robust enough for our purposes, although it was marginally below that of the conventional system.

A common problem in using "although" is to start a sentence with it in a very long clause:

✗ Although many research efforts, at cyclotron facilities throughout the world, have been made to clarify this phenomenon using highly realistic parameters, either experimentally or through simulation, the findings obtained thus far are not encouraging.

By the time the reader gets to the final, opposing clause, he or she can't be blamed for forgetting about the "although" and thus missing the opposition. Such reader-unfriendly text calls for revision:

○ Many research efforts, at cyclotron facilities throughout the world, have been made to clarify this phenomenon using highly realistic parameters, either experimentally or through simulation. However, the findings obtained thus far are not encouraging.

There are other issues of stating opposition, but these will be taken up in a later column.

Searching for Answers...

Search engines like Google and DuckDuckGo have revolutionized the writing task.

But when you use this tool to check language use (e.g. "variety is or variety are"), be careful how you handle the results you get.

You can rely on results from sites like quickanddirtytips.com, merriam-webster.com, or grammarbook.com. But be careful on "forum" sites like english.stackexchange.com, quora.com, and especially reddit.com: read many answers, consider the source, and always stay critical!

Generally, choose one of the prepared search terms presented as you start typing. In Google, get different results by changing your "Region Settings": "United States" or "United Kingdom."

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Mini Quiz: What's Wrong?

1) Here, we aim at increasing the level of...
2) Here, we aim to increase the level of...
3) Our aim here is to increase the level of...
(Answers: 1) Correct, but rather awkward;
2) Good; 3) OK, but a bit wordy)

Author's Toolkit

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Usually it's the "small" words that perform mighty functions within an English sentence. In technical writing, two such little heroes, which sound very similar but have very distinct tasks, are "then" and "than."

"then" or "than"?

There are various pairs of words that can confuse writers and trick spell-checking software: stationary/stationery, proceed/ precede, effect/affect, adopt/adapt, lose/loose, from/form, does/dose, personal/personnel, device/devise, etc.

So the first precaution to take with "then" and "than" is to understand their meanings and not use one for the other.

The word "then" functions as an adverb indicating a subsequent action or state:

○ The solution was then cooled to 120°C.

As an adjective, it indicates a previous role:

○ In 1995, the then president of Underpine Industries decided to enter the robot market.

It is sometimes a noun for "at that time":

○ No other change appeared then.

But that usage is mainly conversational.

A more common conversational usage that should be strictly avoided in technical writing is the use of "then" to mean "therefore/so":

○ A: It's raining now. B: Then bring an umbrella.

✗ The first-stage filtering did not sufficiently reduce the candidates, then we had to…

○ The first-stage filtering did not sufficiently reduce the candidates, so we had to…

As the second and third examples illustrate, the contexts of using "then" as "next" and as "so" tend to be very similar, thus increasing the chances of misleading your reader.

The word "than" is used as a conjunction (like "and/but/so"), generally to show a comparison:

○ At stress points, polymer structures provide greater flexibility than aluminum parts.

Another common comparative usage is to show that a measured quantity exceeds a specified value:

○ After the additional training session, recall improved by more than 60%.

Although it's not strictly incorrect, in writing you should avoid this conversational usage:

✗ Our approach is different than that of Tai et al.

○ Our approach is different from that of Tai et al.

Self-plagiarism Revisited

Earlier this year, I wrote here about the growing issue of publishers becoming stricter about "plagiarism" of previous works, as measured by software. This summer I spoke before a group of medical researchers about this.

As I mentioned in the earlier issue, achieving an acceptably low "plagiarism rating" imposes an exceptionally heavy burden on non-native authors publishing in English, who generally lack the vocabulary and flexibility in English to easily rephrase standard descriptive sentences.

From my most recent look at this issue, I offered my audience a few general tips. First, avoid the temptation of using "copy-paste" between documents; although a great tool, it brings a lot of old baggage from the previous file. Always be rigorous in using complete citations, even of your own work. Learn to use "iThenticate" or other online tools. Finally, inform your editor at an early stage about legitimately reused text and emphasize the key points of originality in your current submission.

I've found no "silver bullet" for avoiding this risk, but I plan to look into it more deeply.

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Mini Quiz: What's Wrong?

1) We must first tackle with the problem of…
2) We must first tackle the problem of…
3) We must first deal with the problem of…
(Answers: 1) NG—incorrect use of "with" after "tackle"; 2) OK; 3) OK)

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Words can be considered the building blocks of explanatory text, such as a journal article. Although there are clearly limits to this analogy, choosing the wrong type of brick can make the whole building come crashing down.

The Right Word

It's common for a set of words with very similar meaning (synonyms) to give nearly the exact same idea in a given context:

○ A large number of previous works found…
✗ A big number of previous works found…

Although both expressions are clear and give the same idea, the second obviously has an unsuitably casual *tone* here. But we can't just ban "big" with a universal preference for "large":

✗ …results had a large impact on our decision.
○ …results had a big impact on our decision.

Again, both expressions are very easy to understand and say the same thing. However, the first is somewhat *colder* and less dramatic here. In both cases above, one word fits best.

In technical writing, aiming for the right word often involves *precision* in making an idea immediately clear. This is a common problem:

✗ …with residue spread over the whole surface.
○ …with residue spread over the entire surface.

These two expressions do have the same meaning, but the second one gives a firmer impression of *total coverage*, while the first seems less definite with its conversational tone.

Some phrases that seem fine when spoken sound oddly imprecise in writing:

✗ …and then filtered the rest of the data.
○ …and then filtered the remaining data.

Similar to the previous case, the second expression more firmly implies *completion*.

Sometimes the bad effect of a poorly chosen word is much less subtle than the above cases:

✗ …is a popular method of positron irradiation.
○ …is a commonly used method of positron irradiation.

The first expression can be understood, but it sounds a bit unnatural. *Popularity* generally implies a subjective human preference, that is, a kind of emotional decision:

○ Starbright is a very popular toothpaste in Asia.
○ The band is popular in both Japan and Korea.

A method, on the other hand, should be selected based on rational decision making.

Sometimes the word that seems the most obvious to clearly express an idea is not:

✗ …could be completed in one procedure.
○ …could be completed in a single procedure.

In this case, the second expression more strongly conveys the idea of one than "one"!

Writing Recommendations

One special writing job is a letter of recommendation, typically for academic posts, technical society fellowships, or awards.

While this isn't difficult to write, some care is needed. First, start it by getting to the point:

✗ Professor Itoh is widely praised for his great…
○ It is my honor to recommend Prof. Itoh for…

In describing achievements, be concrete and detailed rather than effusive:

✗ He has written widely and eloquently on…
○ He has written 33 peer-reviewed articles on…

As an effective way to convey detail, don't neglect the powerful impact of *storytelling*:

✗ She managed the poster session of last year's conference successfully and effectively.
○ For last year's poster session, she personally evaluated each accepted poster and consulted with the authors to raise quality.

Recommend people, not role-fillers.

Writing Questions? read@athuman.com

Mini Quiz: What's Wrong?

1) …is considered as the best solution here.
2) …is considered the best solution here.
3) …is viewed as the best solution here.
(Answers: 1) weak, somewhat old style; 2) better, more modern style; 3) fine)

Author's Toolkit

Writing Better Technical Papers
Ron Read
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(formerly Kurdyla and Associates)

People conducting and presenting cutting-edge research are widely suspected of being highly logical individuals. This is probably a safe assumption about how they conduct research but perhaps not about how they present it.

Untwisting Logic

For simplicity, let's define 'logic' here as the presentation of ideas or connections of ideas in a way that most readers can easily understand:

- ○ This triangle has three sides.
- ✗ This triangle may have more than three sides.

When we regard the logic of language itself, things can get twisted. In a language's grammar, there are typically a few or many 'exceptions':

- ✗ The laser drawed an irregular pattern.
- ○ The laser drew an irregular pattern.

Beyond such simple examples of apparent lapses in logic, there are expressions, evolved over centuries, that can seem puzzling:

- ○ Quite a few attempts have been made to...
- ○ Quite many attempts have been made to...
- ○ Very few attempts have been made to...

The first two sentences have the *same* meaning, although "a few" and "many" have opposite meanings; moreover, the third sentence is the *opposite* of the first one, although "quite" and "very" both strengthen the following idea.

Rather than pondering the 'logic' of irregular usage or seemingly inconsistent expressions, it's best just to accept these oddities and get on with life. However, there are ways you can *positively* apply logic in your technical writing.

First, always ensure that your conclusions are reasonably justified by your results or findings:

- ? Consequently, our approach is effective for...

Was this statement *really* demonstrated by the ideas presented in your text? Or did you overly rely on your own knowledge, which may not have been fully clarified in the text?

A simple trick of logic that can strengthen your writing is to apply *parallel* structures:

- ✗ Yellow dye produces reflective areas, while non-reflective areas are produced by blue dye.
- ○ Yellow dye produces reflective areas, while blue dye produces non-reflective areas.

Both sentences are correct, but the second (parallel) sentence has reader-friendlier logic.

Don't neglect to 'guide' your reader's thinking by showing him or her your ideas' logic through simple *connecting* words or expressions:

- ○ Furthermore, In addition, Moreover
- ○ Therefore, Consequently, Accordingly
- ○ However, On the other hand, Nevertheless

Punctuating Figure Captions

How you use punctuation (. , ; :) in your figure captions is one of those formatting issues that should 1) follow the editorial guidelines of your publication and 2) be done consistently.

The most common question is whether to end with a period. If the caption is only a phrase (not a full sentence), then normally do *not* use a period; if it's a full sentence, or a phrase followed by more content, then use a period.

An increasingly common error is using a semicolon rather than a colon to introduce info:

- ✗ Right image; expansion, left; contraction
- ○ Right image: expansion; left: contraction

As shown above, semicolons can be used in place of commas to more clearly separate items.

Finally, journals position letters identifying sub-figures differently (before *or* after):

- ○ SEMs show (a) cracks, (b) cuts, (c) pits...
- ○ SEMs show cracks (a), cuts (b), pits (c)...

Although the first style is more common, follow journal guidelines and *be consistent*.

Writing Questions? read@athuman.com

Mini Quiz: What's Wrong?

1) The procedure is consist of many sub-tasks.
2) The procedure consists of many sub-tasks.
3) The procedure is consisted of many sub-tasks.
(Answers: 1) incorrect; 2) good; 3) 'debatable' grammar, in any case bad style)

Author's Toolkit

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It's normal for a researcher to get excited about his or own work and to express this enthusiasm in the paper that reports this work. But bringing too much enthusiastic feeling to a paper might be more hurtful than helpful.

Hold the Hyperbole

In the last issue, I mentioned how your writing should not be excessively humble and thus indirect. The other side of the coin is to avoid writing that is unnecessarily emphatic or obviously exaggerated.

One of the most common adages of writing is "Never write *very*"! In technical writing, of course, the word "very" can effectively strengthen adjectives that widely vary in the extent of their quality:

- O The additional polishing process created a very clear lens surface.

On the other hand, "very" not only fails to strengthen but in fact weakens the impact of adjectives that are inherently strong:

- ✗ The additional polishing process created a *very* vibrant lens surface.
- O The additional polishing process created a vibrant lens surface.

In the above example, "very" adds no strength but instead dilutes the sentence's drama; without "very," "vibrant" can really shine!

The impact-destroying function of "very" can be seen in many common expressions:

- ✗ The reaction caused a *very* dramatic change in appearance.
- ✗ It is *very* significant that the signal remained…

Both of the above sentences are better without "very." Each time you use this word, carefully consider whether it helps or hurts the sentence.

Some words' concepts *cannot* be logically expressed in degrees of variation:

- ✗ This *absolutely* requires a quiet environment.
- ✗ It is *truly* essential to remove all noise.
- ✗ Safety rules *strongly* prohibit unshielded ore.

Something is *either* required (essential, prohibited) *or* it is not; there is no in-between state of these words, so don't try to modify them.

Furthermore, remember that your readers will surely appreciate precise expressions over flamboyant braggadocio:

- ✗ …thus showing extremely huge improvement.
- O …thus showing nearly 70% improvement.

Keep your sentences simple, clear, and *calm*.

Checking for Plagiarism

Recently, some of our clients have been asked by editors to reduce the "plagiarism" in their manuscripts, as detected by anti-plagiarism software or online services.

Of course our clients, from Japan's finest universities, companies and research institutes, would never commit plagiarism in the classic sense, that is, stealing specific ideas or even exact wording from another author. Instead, such software and services usually find instances of highly similar text from a different but related paper the same author has submitted previously to a conference or journal.

Complying with the requirement to hit a low "plagiarism rating" adds yet another burden on non-native authors publishing in English, who are already at a great disadvantage due to their own language not being English.

We have "varied" the wording of manuscripts at our clients' request, and it is different work from "straight" rewriting. However, so far, I'm still charging our normal rewriting rates for this.

Writing Questions? read@athuman.com

Mini Quiz: What's Wrong?

1) All of the samples were not highly reflective.
2) No sample was highly reflective.
3) No sample was not highly reflective.

(Answers: 1) key *negative point* is buried at end of sentence; 2) *negative point* is immediately clear; 3) "double negatives" can confuse readers)

Author's Toolkit

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In many cultures, the principle of "humility" is thoroughly incorporated in all communications. Japan is certainly one of these cultures. However, this principle may not transfer so smoothly to scientific writing in English.

Boldness in Writing

Humility is both a personal and a cultural attitude taken to avoid giving the impression of arrogance. However, the world of scientific publishing is becoming increasingly competitive.

In technical documents, "humble writing" most often arises in expressions that are overly tentative, especially regarding the author's intended action:

✗ We are trying to investigate the effects of…
○ We are investigating the effects of…

The first sample is wordy but more importantly misuses the word "investigate," which certainly implies an effort. Your investigation itself may or may not be fruitful, but in either case you are still "investigating," that is, trying to learn.

Similar expressions involving effort have come to seem like natural idioms:

✗ We are now working to develop a unit with an even longer sensing range.
○ We are now developing a unit with an even longer sensing range.

Of course, the notion of "work" is inherent in "development." The new development may or may not be successful, but readers understand that it involves work either way. A valid use of the first sample would be to *quantify* the effort:

○ We are now working *hard* to develop a unit with an even longer sensing range.

In addition to expressions showing efforts and attempts, take care to not be overly tentative in stating the significance of results obtained:

✗ From these results, we can say that our modified model provides a quicker response.
○ From these results, our modified model provides a quicker response.

In the first sample, "we can say that" makes no sense if you have just presented data that objectively show your conclusion. Furthermore, it gives the impression that you are too defensive about the position you take.

As another example that implies a lack of confidence in your findings, the word "believe" is often unnecessarily used, and used to bad effect:

✗ The clinical results clearly indicate, the authors believe, a neurological cause.
○ The clinical results clearly indicate a neurological cause.

If the results are strongly compelling ("clearly"), don't introduce the uncertainty of "belief." This word should only be used where there is significant doubt of the results' meaning:

○ Although further clinical trials are needed, the authors believe the current results indicate a neurological cause.

Recheck your sentences to ensure they are direct, meaningful, and bold.

Punctuation to Introduce Equations

At the end of a phrase that introduces an equation, do not use a colon if the equation continues the sentence as a word:

✗ Here, yAB is expressed as: [*equation*]
○ Here, yAB is expressed as [*equation*]
✗ In this case, length is given by: [*equation*]
○ In this case, length is given by [*equation*]

Only use the colon for a natural break:

○ Here, yAB is set as follows: [*equation*]
○ In this case, length is set recursively: [*eq.*]

Consider *how* the equation fits the sentence.

Writing Questions? read@athuman.com

Mini Quiz: What's Wrong?

1) First, we explain the outline of our paper.
2) First, we describe the outline of our paper.
3) First, we give an outline of our paper.
(Answers: 1) and 2) verbs do not suit this context of object "outline"; 3) suitable verb in this case)

Author's Toolkit

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Any technical paper submitted for publication in a journal or for inclusion in a conference of course contains many ideas, and it's to be expected that several will be stated repeatedly.

Repetition in Writing: Good or Bad?

This is an *or question* that has only one reasonable answer: "Yes!" Repetition of ideas can have either a positive or a negative effect.

The major way repetition is effectively used in a paper is structurally, through the document's architecture that reflects "classical essay style." Here, key ideas are stressed in the abstract, previewed in the introduction, clarified in the main body, and reviewed in the conclusions:

- O Therefore, detection time greatly decreases.
- O Thus, we significantly reduced detection time.
- O ...indicate a 47% drop in detection time.
- O ...showing a much shorter detection time.

The wording of the repeated expressions can vary, but they must clearly show the same idea.

A common form of ineffective repetition is the use of 'figure-centric' sentences:

- ✗ Figure 7 shows video images captured at high resolution. These images reveal phenomena that were previously overlooked.

Stressing the finding rather than describing a figure provides noticeably higher impact:

- O High-resolution video images (Fig. 7) reveal phenomena that were previously overlooked.

Repetition is also not effective when it simply repeats words describing minor points:

- ✗ This achieves a greater resistance to heat. And a greater resistance to heat allows us to use the probe at higher temperatures.
- O This achieves a greater resistance to heat, which extends the probe's usefulness.

However, if this idea were a major point, repetition would be an effective way to stress it:

- O This achieves a greater resistance to heat. In other words, the probe can now be used in high-temperature environments.

One highly effective form of repetition is to use demonstrative adjectives and pronouns:

- ✗ New approaches to this have emerged in recent years. The new approaches all apply big data, and the new approaches are much more cost-effective than previous approaches.
- O New approaches to this have emerged in recent years. These approaches all apply big data, and they are much more cost-effective.

This simple technique keeps readability high and more tightly connects different aspects of the same idea.

Using repetition is like using **boldface** fonts: a little bit is effective, but too much is meaningless.

Specialized Terms "Out of the Blue"

In principle, you should use technical terms that the vast majority—if not all—of your readers can understand without Googling. While revising papers, I sometimes notice the sudden use of a technical term that appears outside the paper's main field, with little or no explanation.

For example, in a paper that applies DNA technology but is not focused on DNA or aimed at DNA specialists, readers might be confused by

- ✗ For these values, we relied on results obtained by the chain termination method.

Adding just a little background info greatly improves the readability of the sentence:

- O For these values, we relied on results obtained by the chain termination method, also known as Sanger sequencing, since it is one of the most well-established and widely used DNA methods.

As always, think of your readers!

Writing Questions? read@athuman.com

Mini Quiz: What's Wrong?

1) ...made a great contribution to the society.
2) ...made a great contribution to AI community.
3) ...a great contribution to the global economy.
(Answers: 1) delete "the"; 2) change to "to the AI community"; 3) OK)

Author's Toolkit

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One of the most basic types of explanation in a technical paper is giving the *reason* for an action or state. Naturally, this should be done clearly.

Reasonable Reasons

A previous column covered typical problems in expressing *cause and effect*. Here, we take up additional issues in this important task.

Within a sentence, the most common word used to introduce a cause for something is "because," which joins two clauses:

○ The robot has extra shielding on its joints because it operates many hours outside.

○ Because the robot operates many hours outside, it has extra shielding on its joints.

When a clause is connected to a noun phrase as the reason, "because" is followed by "of":

○ Extra shielding is needed at the joints because of the harsh weather conditions.

However, this can seem awkward when sentences already use phrases containing "of":

? Most of the transitions of temperature are because of structural instability.

In such cases, a useful alternative is "due to":

○ Most of the temperature transitions are due to structural instability.

Remember that the word "cause" can be flexibly used as both a noun and a verb:

○ This excessive fluctuation in current load is the cause of the accelerated power drain.

○ This excessive fluctuation in current load causes the accelerated power drain.

Various other words can be used to express causation:

○ This excessive fluctuation in current load accounts for the accelerated power drain.

○ The accelerated power drain is attributed to this excessive fluctuation in current load.

Another approach is to use a more direct verb of action that clearly implies a cause:

○ This excessive fluctuation in current load accelerates the power drain.

Sometimes the author's meaning becomes confusing when more than one "cause link" appears in a single sentence:

✗ Signals are sometimes misdirected because the proper transmission path cannot be clearly determined due to local topography.

The above sentence can be understood, but it may require two or three re-readings (reader-unfriendly). It's thus better to distinguish the links of causation:

○ Signals are sometimes misdirected because the proper transmission path cannot be clearly determined, which is due to variations in the local topography.

○ Signals are sometimes misdirected, since the local topography can make it difficult to clearly determine the proper transmission path.

Finally, I frequently observe the lack of an explicit indication of cause:

✗ The survey responses did not vary with the color of the stimulus. We ruled out color as a significant factor.

○ The survey responses did not vary with the color of the stimulus. Therefore, we ruled out color as a significant factor.

Although the first example is basically clear, the easy addition of "therefore" is a powerful way to help your reader by guiding his/her thinking.

Acknowledgment? Acknowledgments?

Although a few journals may always use one or the other, the simplest solution is to use the singular when you're thanking only one person or funding source, the plural when thanking two or more people or funding sources.

Grammar Questions? read@athuman.com

Mini Quiz: What's Wrong?

1) This is a basic principal of genome theory.
2) The principle cause of this reaction is…
3) In principle, any medium can be used to…
(Answers: 1) change to "principle"; 2) change to "principal"; 3) OK)

Author's Toolkit

Writing Better Technical Papers
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A task that always accompanies publication of a technical paper is corresponding with an editor and possibly reviewers.

Corresponding with Editors/Reviewers

The editors of technical journals have the difficult but critical job of ensuring that paper submissions meet their basic standards for publication and, moreover, contribute to the prestige of their periodicals/organizations.

I often assist my customers in responding to editors and reviewers (or 'referees'). Let me give some common-sense advice on this.

First, prioritize the needs of the journal's *readers*, as the editor certainly does:

✗ This work will greatly advance the field of…

○ Our results for all-weather sensing will greatly interest the readers of *Android News*…

In addressing referee comments, respond to *all* points made, both major and minor. Start with a humble and *cooperative* tone:

✗ The points you raised are duly noted.

○ Thank you very much for your helpful comments on our paper.

It's certainly normal for authors to be passionate about their work, but you should avoid sounding overly defensive, argumentative, or insulting:

✗ The referee clearly does not have sufficient knowledge of this new technology, and thus is not qualified to make such comments.

○ It seems that the referee did not fully understand my explanation—sorry I was not clear. Let me give an example that may help.

✗ The referee's point makes no sense in this context and thus we can neglect it.

○ This point is not applicable here because…

Clearly it is not a good strategy to fight with people the journal has entrusted to evaluate submissions.

For detailed replies to major comments, first indicate that you understand the points raised, then quickly clarify the points you agree with, next explain your disagreement, if any, with other points, and finally describe how you are going to modify your paper.

For very simple replies to minor comments, a standard "boilerplate" answer is fine:

○ This was revised as you suggested.

When citing the location of a revision—such as page and line numbers—be sure to clarify whether you are referring to the newer/revised version of the paper or to a previous version.

An attitude inviting open collaboration with the reviewers will only strengthen your paper!

Figure Numbers: Give a Final Check!

Typically, a paper is revised many times before its final submission. A common change that arises from this process is new, replaced, or deleted figures, requiring some or all figure numbers to be changed.

This is not a major hurdle, it simply requires the author to make a new sequence from Fig. 1 to Fig. *n*. However, the tricky part is ensuring that all mentions of figures in the text are changed to the final figure numbers.

In my customers' papers, I sometimes see a text description of a figure that refers to an *old*, incorrect figure number. Normally, I can correct this, but if a few figures are very similar, an error may be easy to overlook.

Even if you use hyperlinks to figure numbers, *always confirm* in your final version that figure numbers in the text match the right figure.

Grammar Questions? read@athuman.com

Mini Quiz: What's Wrong?

1) One possible approach might be to adjust…

2) This can potentially be useful for finding…

3) One possible option is to increase the…

(Answers: 1) change to "possible approach is to"; 2) change to "this is potentially useful"; 3) OK, but "possible" is usually unnecessary here)

Author's Toolkit

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In the last column, I discussed "telling verbs" as words commonly used when telling or giving information. Now, I'd like to bring up and discuss a few more of these words.

Telling Verbs Revisited

Sometimes a verb's "teller" isn't the author but graphics such as figures and tables. The most universal verb for this is simply "show":

- ○ Figure 3 shows the results of this experiment.
- ○ Table 5 shows the combinations of…

For an effect or trend that is visualized symbolically, a common verb with graphics is "illustrate":

- ○ Figure 3 illustrates the temperature rise induced by adding…
- ○ Figure 7 illustrates the p^{n-7} dependence on…

A typically overused verb is "depict"; I suggest reserving this word for something that is visualized as an image:

- ○ Figure 4 depicts the net topology of this…
- ✗ Figure 4 depicts the measured values of…

Sometimes, for both variety and clarity, it's useful to let a verb phrase do the telling:

- ○ Figure 5 provides an overview of the…
- ○ Tables 11–14 give summaries of the…

As a final note on graphics, avoid the common problem of using verbs that are mainly suitable for verbal elaboration in text:

- ✗ Figure 8 explains the results obtained by…
- ○ Figure 8 shows the results obtained by…
- ✗ Table 9 describes all original samples and their changed values by modifying the…
- ○ Table 9 lists all original samples and their changed values by modifying the…

A couple of verbs that often confuse native speakers are "imply" and "infer." Actually, only the former is a "telling" verb, which means to state something somewhat indirectly:

- ○ Various results obtained by recent works imply a threshold exists where the…
- ✗ Various results obtained by recent works infer a threshold exists where the…

"Infer" is a verb of perceiving rather than telling; it means something is understood in the manner of an assumption or conjecture:

- ○ From the recent results, we can infer that a threshold exists where the…

"Indicate" is a bit trickier—sometimes it simply means "show":

- ○ The dashed line indicates Sample A's results.

And in other contexts, "indicate" refers to a strong or highly logical implication:

- ○ Data from 4,308 monitoring stations indicate a clear warming trend in the Arctic Ocean.

Finally, in discussing previous works, use "reported that" and "reported a/an" carefully:

- ○ Minoo reported that a human-like android could skillfully perform tango dancing (5).
- ○ Minoo reported a human-like android that could skillfully perform tango dancing (5).

Thus "reported that" is followed by a verb phrase, and "reported a" by a noun phrase.

Ending a Paper Too Suddenly

At the end of a paper, in the Conclusions section, many authors tend to finish up rather abruptly, simply listing off summary points:

- ✗ Finally, our results for Au-coated nodes show only minor improvement in speed.

The Conclusions section must not only summarize results but also outline a larger significance, i.e., why the paper is important:

- ○ In this work, we demonstrated that a sensor network's speed can be greatly increased without the need for complicated processes.

Grammar Questions? read@athuman.com

Mini Quiz: What's Wrong?

1) The variety of such devices is so large that…
2) A variety of such devices are now used to…
3) A variety of nutrients are important for…
4) A variety of nutrients is important for…

(Answers: 1) OK; 2) OK; 3) OK, depending on context; 4) OK, depending on context)

Author's Toolkit

Writing Better Technical Papers

Ron Read

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In a scientific paper, a class of verbs that is almost always used involves telling or giving information. Although these verbs share a basic function, they are not always interchangeable.

Telling Verbs

A common use of "telling" verbs is to give a "preview" in the Abstract or Introduction:

○ The focusing lens *is described* in Section 3.
○ We *discuss* previous attempts to separate these signals in Related Works.

Here, "describe" means informing about aspects, performance, appearance ("it has irregular curvature"); on the other hand, "discuss" means to raise and elaborate related points ("Most approaches have applied…").

Problems can arise when you use a particular "telling" verb for the wrong purpose:

x Here, we explain this material's properties.
○ Here, we explain this material's property of radiation deflection.

"Explain" typically gives information on *how* something works (process) or *why* something happens (reason). The second example fits this purpose, while the broader first example would use "describe" or more generally "discuss."

Other "telling" verbs have different functions. Usually, "state" is used to set out a formal expression or put forward a position:

○ In Section 4 we *state* three hypotheses for this phenomenon.
○ Finally, in Discussions, we *state* our interpretation of this phenomenon.

Although it's usually used as a noun, "list" can be useful to name the items in a set:

○ Table 5 *lists* all of the combinations tested.

The verb "summarize" means to highlight key points, not give exhaustive descriptions, of items in a set:

○ Finally, we *summarize* our experimental results in Section 4.

Here are two useful verbs for telling survey-type information:

○ In the next Section, we review the major previous methods used to achieve this.
○ In this section, we overview the current approaches to resolving this issue.

Some telling verbs are used simply as a way to provide information:

○ We *give* our results in Section 5.
○ We *offer* our results in Section 5.
○ We *present* our results in Section 5.

Writers often give much attention to using different verbs in each sentence of a series of previewing sentences. In principle, aiming for variety is good, but it's more important to risk a little repetition and use just the right verb.

Varieties of Spacing

Most spacing in text follows fairly universal guidelines, such as for values and units:

x Signal throughput exceeds 85Mbps.
○ Signal throughput exceeds 85 Mbps.

The first may appear on a trendy product, but only the second is correct for a publication.

One variation of spacing is for temperature:

○ The final temperature was 84.7°C.
○ The final temperature was 84.7 °C.

Journals following the unusual second style, however, do *not* use a space for an angle:

○ The angle of refraction was 35°.

One other infrequent but proper use of a space is before a percentage sign:

○ This represents 48% of the total population.
○ This represents 48 % of the total population.

If unsure about accepted spacing in your journal, check with the guidelines or editors.

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) …and temperature decreases down to 23°C.
2) …and then rises up to 37°C.
3) …and afterwards it went up to 37°C.
(Answers: 1) delete "down"; 2) delete "up"; 3) OK)

Author's Toolkit

Writing Better Technical Papers

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Many areas of our lives require fairly firm control of that most precious of commodities: *time*. The task of writing is certainly one of these areas.

How well you apply your time-management skills to a writing job could have a significant impact on the quality of your document, as well as your own physical and mental well-being.

Time Management: Critical for Writers

Since the Kansai Branch of Kurdyla and Associates basically operates on a "24/7" basis, over the years I've become very familiar with the time-management habits of our customers.

All journals and conferences have a deadline for submission of papers, letters, or proceedings. Editors and conference staff set these "due dates" to ensure adequate review of submissions and to facilitate smooth preparation of publications and events.

As I mention in my *Fundamentals* seminars, "about 99.99% of people" underestimate the time a writing job actually takes. I really don't think my estimate is much of an exaggeration. If we think it can be done in two hours, it takes five hours; if we think we can finish a job by Thursday, it takes us until Saturday. Or we lose a lot of sleep!

The first and perhaps biggest issue is actually *starting* a project. It's easy to imagine a final document, or even to compose sentences in our head; it's difficult to get down to the actual work of writing. But unless you actually *start writing*, on your computer or even rough paper, it's impossible to progress toward completion of your document.

Start big or start small: sketch out a diagram of the paper's overall structure, or draft sentences that describe your most complex ideas. The main thing is to start something without wasting too much time in thought: The process of refining from a rough start is both satisfying and productive.

Another basic time-management technique is to "sleep on it." Rather than struggle with a document, get away from it and sleep, take a walk, watch TV or drink a beer. Returning to a writing task with a "fresh mind" can both save time and produce higher-quality writing.

Minimize distractions (phones, people, TV) while writing, but since you're not an android, maybe rewarding yourself with a short YouTube video after an hour of writing would be OK.

Of course, finishing ahead of the deadline is greatly appreciated by editors, especially when a complicated review process is required. And a "last-minute" submission may raise questions about the paper's level of preparation.

Finally, bear in mind that your schedule will affect others: colleagues, rewriters, editors, and conference secretariat staff.

Keep to the task with an eye on the clock!

Take Care with "Chapters"

A common error I've noticed over the years is authors mistakenly using the word "Chapter" for a major part of a single paper, which is normally called a "Section":

- x　The theoretical framework of our approach is described in Chapter 3.
- O　The theoretical framework of our approach is described in Section 3.

Typically, a chapter is a major division in fiction and non-fiction books or, in technical literature, an entire paper in a collection of papers. Check your journal's "guidance for authors" if in doubt.

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) …to repair defects occurring in the module.
2) …to repair defects occurred in the module.
3) …to repair defects that occur in the module.
(Answers: 1) OK; 2) incorrect; 3) OK)

Author's Toolkit

Writing Better Technical Papers

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In both speaking and writing, it's common to start an idea, where "idea" means any basic concept stated as a sentence, and then elaborate on some point before finishing the idea. This can usually be done without harming understandability (see previous sentence), but there are risks involved.

Embedding: Dangerous Diversions

The term "embedding," as used in writing style, refers to the interrupting phrases or even clauses that are placed within a sentence between its opening and completion. This is usually done to specify some point within a larger idea:

○ All of the trial subjects, who were university students aged 18–24, spoke Japanese as their native language.

In the above sentence, the added detail about the subjects, their occupation and age, was inserted without harming the flow of the main idea, the native language of all subjects.

However, embedding can be harmful when it impedes or even blocks the main idea from reaching the reader. The most common cause of this damaging effect is embedded content that is simply too long:

x We then replaced the T-structure, which as noted above has caused such problems as dropped transmission, powerline noise, overheating and popping, with the more advanced Y-structure.

This sentence can certainly be understood, but it may take a second or even third reading for some people. Always aim for understanding after one reading. The simple solution is to separate the added detail from the main idea:

○ The T-structure, as noted above, has caused such problems as dropped transmission, powerline noise, overheating and popping. Therefore, we replaced it with the more advanced Y-structure.

Another kind of bad embedding is adding detail that has weak relation to the main idea:

x A before/after comparison, which was also made by Perrydale et al. [8] with similar results, shows a large increase in refractivity.

○ A before/after comparison shows a large increase in refractivity. Perrydale et al. [8] obtained similar results in their work.

When using an embedded expression, take extra care that it does more help than harm.

Text Inside Figures

Some figures require explanatory text within graphs, charts, or illustrations. This includes not just the labels of graph axes and numbers on scales but also values at key points of a line or bar graph, legends for compared factors or conditions, and various notes or identifications inside the figure.

A few simple guidelines should be followed when using in-figure text. First, take care to maintain consistency: text font, size, color, and style (e.g. bold, italic). Of course this does not mean you can't vary elements like text size and color, but apply such variation *consistently* within and among all figures of the paper.

Also carefully consider whether added text in the figure is *really* necessary—can the same points be understood just by common sense, or can they be expressed in the caption?

A particularly common but easily avoidable problem is using two-byte fonts, like MS Gothic, inside the figure to write Romanized text. Besides being troublesome for overseas editors, fonts designed for Japanese or Chinese just look **bad** for English. Use a one-byte font like Arial.

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) First, access to the shielded region.
2) First, gain access to the shielded region.
3) Accessibility to the shielded region is vital.
(Answers: 1) delete "to"; 2) OK; 3) OK)

Author's Toolkit

Writing Better Technical Papers

Ron Read

Kurdyla and Associates Co., Ltd.

The vast majority of punctuation marks we use daily are commas and periods; however, the other punctuation tools we have can be useful in particular situations. One such underused punctuation mark is the semicolon.

The Mighty Semicolon

The primary use of the semicolon is dividing independent clauses in place of a typical comma-plus-conjunction structure:

○ Eye gaze has been extensively studied as an indicator of human intention [5–9], and it may also indicate deeper cognitive function.

○ Eye gaze has been extensively studied as an indicator of human intention [5–9]; it may also indicate deeper cognitive function.

Although from a mechanical point of view semicolons divide ideas, their more important expressive role is to *unite* similar, tightly connected ideas. In the second example above, the relationship between previous findings and an interesting possibility is expressed in a more immediate and even dramatic way.

A semicolon also joins ideas connected by a conjunctive adverb (*therefore, furthermore,* etc.) more tightly than a period does:

○ None of the subjects self-reported a color bias. Nevertheless, 83% of them chose red.

○ None of the subjects self-reported a color bias; nevertheless, 83% of them chose red.

However, do not use a semicolon before a conjunctive adverb that's placed between a clause's subject and verb:

x Most subjects; however, did not self-report a color bias.

○ Most subjects, however, did not self-report a color bias.

Furthermore, don't make the more common error of using a comma with conjunctive adverbs when a semicolon is needed:

x Several non-human animals use language, however, none appears to use it abstractly.

○ Several non-human animals use language; however, none appears to use it abstractly.

A second common semicolon use is to divide the elements of a series when they are rather complex and may include their own commas:

○ We classified aberrations into three types: minor, including influences of environmental noise; user-induced, which refers to improper use of the test apparatus; and interference, encompassing sporadically induced signals.

Don't make the common error of using a semicolon, rather than a colon, to start a series:

x Here, there are three types of aberrations; minor, user-induced, and interference.

○ Here, there are three types of aberrations: minor, user-induced, and interference.

Used properly, the trusty semicolon will add variety and readability to your document.

Italicize with Care!

Italics refer to the typographical style that *slants* the characters in your text. The usage of this style is usually determined by editorial policy or by an individual editor.

Italics can add emphasis:

○ However, this does *not* imply causation.

Although a traditional use of italics is for "foreign" words, most journals do not use italics for very common Latin-derived terms:

x *etc. / e.g. / i.e. / et al.*　○ etc. / e.g. / i.e. / et al.

Another typical use is for book/movie titles:

○ Accordingly, *Astro Boy* has deeply influenced current Japanese research on androids.

Eventually, a journal's own style will dictate italics usage. Try to find this out in advance.

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) It is required to heat the solution to 47°C.

2) It is necessary to heat the solution to 47°C.

3) This requires heating the solution to 47°C.

(Answers: 1) "required" is rather awkward with "It is…" dummy subject; 2) OK; 3) OK)

Author's Toolkit

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It's always nice to get a good *start* to any worthwhile task or project. This is definitely true for the sentences you write in your paper.

Starting the Sentence

When speaking, people start saying their ideas in a natural way; in English, this typically follows the basic subject-verb-object pattern:

- ○ I read an interesting article this morning.

Such direct, intuitive phrasing is also usually best in writing sentences for a scientific paper:

- ○ These misdirected signals then entered an unmonitored region.

However, compared with natural speaking, in writing we can be much more deliberate and strategic in casting our sentences, including their opening. One common sentence opening is an introductory phrase that sets up the context of the main idea:

- ○ In an effort to minimize erroneous signals, Goldman et al. [9] designed a new…

This is usually fine when the connection between the introductory expression and the main sentence is clear, but sometimes that connection becomes weak or even broken. A typical example of this arises with some sentences beginning with "Although":

- ○ Although the temperature increases in this process, thermal stability remains viable.
- x Although the temperature increases, due to such factors as chemical interactions, random electrical discharge, and variations in conductive materials, among other real-world conditions, thermal stability remains viable.

Although the first example very clearly presents contradiction, the second one is made fuzzy by the extensive intervening information. In such a case, a clearer expression would put the 'contradiction signal' between the two parts:

- ○ The temperature increases due to such factors as chemical interactions, random electrical discharge, and variations in conductive materials, among other real-world conditions; however, thermal stability…

Another common weakness in sentence openings is beginning with the conjunctions "And," "But" and "So":

- x And the android's upper body DOF can now be set according to the application.
- ○ Furthermore, the android's upper body DOF can now be set according to the application.

This is not bad grammar or unacceptable usage, but as someone who was rather traditionally trained, I think it's a bit too glib and even a bit too disrespectful of the readers.

Excessive Detail in Introduction

The Introduction section of a scientific paper has a limited purpose: introducing the paper's work. This involves stating the problem tackled, overviewing the previous attempts and their achievements/shortcomings, summarizing the methods used and results obtained, and claiming the significance of the paper's findings.

Your task is not to write an entire history of your work's domain or to simply copy the details to come in later sections. Concise is nice.

One way to write background more succinctly is to group previous works into 'categories' rather than citing each one:

- x Jacobi and Carr simulated Z-rays, Tanaka et al. simulated Q-emissions, Xu simulated…
- ○ Several previous works attempted simulation methods to achieve this [3, 5, 8–12].

Remember: You're writing the introduction to a journal paper, not to a book!

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) …by a general error-reduction method.

2) …by a conventional error-reduction method.

3) …by a usual error-reduction method.

(Answers: 1) too vague; 2) OK; 3) too conversational—in *certain contexts* "the usual" might be appropriate)

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The world's myriad languages have many ways of handling, or not handling, expressions of plural usage. Trying to understand them in a second language is not easy, but it is easy to make erroneous assumptions about them.

Over-logical Plural Usage

Plural nouns, expressing "more than one" of something, are usually formed by adding "s," for example, "two circuits," or in particular cases a Latin plural, such as "two stimuli."

At that simple level, most non-native writers of technical English can handle plural usage correctly. But more complicated singular-plural distinctions can cause confusion. Typical examples include idiomatic phrases:

x These samples revealed their luminance to some extents.

x Evidences of deterioration were clearly observed.

x Taking advantages of the material's advanced properties, we attempted…

Without considering real-world English usage, all of the sentences above seem logical from a purely analytical viewpoint: "each sample has its own extent of luminance"; "there are different types and instances of evidence"; "the material's properties have various advantages."

But that's not how these phrases operate: "some extent" is an indefinite range; "evidence" is the entire body of proof; "advantage" is the good use of something. So we have

O These samples revealed…to some extent.

O Evidence of deterioration was clearly…

O Taking advantage of the material's…

Another type of sentence structure that can be tricky is when the verb "to be" ("is," "are") connects a plural subject with a singular complement:

O Lost connections are a major problem in reverse-passive networks.

While this sentence is grammatically correct,
it sounds awkward due to the "are + a problem" combination. This uncomfortable expression can be fixed by modifying the subject:

O The occurrence of lost connections is a major problem in reverse-passive networks.

Or it can be improved by using a different verb than "be":

O Lost connections pose a major problem in reverse-passive networks.

Viewpoint of Acknowledgment(s)

Typically, between the Conclusions and References sections, authors insert their "Acknowledgments" to thank those who assisted them, either with money or with skills/advice.

A common error is mixing the *viewpoint* of the author between "first-person" and "third-person" styles:

x The authors appreciate the contributions of Dr. Wu of…We also wish to thank…

Most readers can easily recognize that "authors" and "we" are the same people, but still this is improper usage that should be avoided. As in most writing, aim for consistency here:

O The authors appreciate the contributions of Dr. Wu of…They also wish to thank…

O We appreciate the contributions of Dr. Wu of…We also wish to thank…

Of course the passive voice can be used, in moderation, to add variety without disturbing the viewpoint:

O We appreciate the contributions of Dr. Wu of…Gratitude is also extended to…

O The authors appreciate the contributions of Dr. Wu of…Gratitude is also extended to…

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) An equalizer is incorporated into the system.
2) Two new items were added into the list.
3) A weak solvent was blended into the mixture.
(Answers: 1) "in the"; 2) "to the"; 3) OK)

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In pop music and pop psychology, the suggestion to "accentuate the positive" has a long tradition. But in technical writing, sometimes it's a negative idea that deserves emphasis.

Accentuate the Negative

In attempts to describe, explain, prove or disprove, it's not uncommon for the main idea to be what something is *not*. In such cases, beyond simply using the word "not" it may be best to orient the entire sentence's structure to "not."

One of the most common weaknesses in expressing a negative idea is when the negative aspect is *absolute*. Consider these examples:

x All of the samples tested, whether organic or inorganic, were not able to meet the minimum performance requirements.

O None of the samples tested, whether organic or inorganic, were able to meet the minimum performance requirements.

Both of these sentences are understandable and grammatically fine, and they have the exact same meaning. But the initial impressions they make on the reader are significantly different.

In the first example, the reader initially expects to read about something that is completely inclusive ("All of…"), but then his or her thinking is reversed with the negating "not." In the second example, the reader immediately gets the idea of absolute absence: "None of."

In other words, by giving the "negative idea" the primary position in the sentence, you are much more effectively guiding the reader's thinking.

The "neither/nor" structure is another powerful tool, used in an appropriate context, for stressing a negative point that applies equally to two possibilities. Be careful, however, not to add another negative expression after it:

x Neither film A nor film B could not reflect low-angle beams from the lens.

O Neither film A nor film B could reflect low-angle beams from the lens.

On the other hand, don't use a "literary not" when a simpler expression can express your idea more directly:

x Not a few researchers have attempted to…

O Many researchers have attempted to…

Negation is a common and important job in technical writing—do this job purposefully.

A Tense Issue

Recently, I've seen more submissions to IEICE Journals that mention specific previous works in the present tense.

? Suzuki et al. [6] approach these types of problems using an inverse transform.

? Martin and Zheng [7] discuss a more direct method of filtering the results.

This trend seems a bit strange to me, especially if the cited work was done far in the past—the work *may* be ongoing, but very often it isn't. Following one of my favorite references (*How to Write and Publish a Scientific Paper*, Day and Gastel, 2006, Cambridge University Press), I recommend using the present tense for general past results but the past tense for specific attributions:

O These materials are known to inhibit cell growth in a vacuum [1–3, 5].

O Reduced oxygen also inhibits this growth [4].

O Suzuki et al. [6] approached these types of problems using an inverse transform.

O Martin and Zheng [7] discussed a more direct method of filtering the results.

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) …and then RoboJac approached to target A.

2) …and then RoboJac approached target A.

3) RoboJac's approach to Target B was direct.

(Answers: 1) Delete "to"; 2)/3) OK)

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Writing Better Technical Papers

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As I've mentioned many, many times in my lectures and seminars, by far the biggest writing problem in technical papers by non-native (and often native) writers of English comes from sentences that are too long. But does the opposite tendency cause problems?

A Sentence that's Too Short?

Since the confusion caused by overly long sentences is so pervasive in technical/academic literature, I nearly hesitate to bring up the issue of overly short sentences.

What's the problem with a short sentence?

Short sentences are not inherently bad, but they degrade readability when they break the mental connection between the parts of an important idea. Consider these examples:

x The signal grows weak at conventional passive nodes. However, the signal gains strength at our electron-charged Z-nodes.

O The signal grows weak at conventional passive nodes but actually gains strength at our electron-charged Z-nodes.

Both of the above passages are easy to understand, and they basically have the same meaning. But the overall messages they convey to the reader are significantly if subtly different.

In the first example, we have "This happens under one condition/Something else happens in another condition." The second example, however, more directly says, "What happens under one condition is different from what happens under another condition." Keeping everything (the two nodes' performances) under a single sentence adds communicative power.

Another reason not to write very short sentences, especially in succession, is to avoid the "machine gun" effect:

x Many approaches have been attempted to solve this problem. Gorem et al. proposed T-transform (4). Maekawa and Uchida suggested intermittent rotation (5). Budofsky introduced tension-release cycles (6).

O Many approaches have been attempted to solve this problem, including T-transform (4), intermittent rotation (5), and the introduction of tension-release cycles (6).

Instead of having a series of "rapid fire" sentences that each gives a little information, the second example includes all of the needed information in a series within one sentence, and thus it's easier on the reader's eyes and brain.

Just as a very long sentence can sometimes be good writing (though doing this is difficult), short sentences can sometimes have a good effect. For example, the second sentence of the passage below adds dramatic emphasis:

O When calculated over distances of millions of light-years, its precision drops exponentially. For intergalactic travel, this is unacceptable.

Sentence length is definitely one of the tools that can help you build stronger text.

Which Authors?

A common writing task, mainly in the Introduction or Discussion, is to review previous work related to your current work. In doing this, authors can get careless with "authors":

? …was studied by Zhang et al. To extend this, the authors implemented the notion of…

Who are "the authors" here? Zhang and friends? Or the authors of *this* paper? Normally, "the authors" is used to refer to the producers of the current paper, although sometimes it's used to identify the writers of the referred paper. If the context, verb tense or other 'hint' doesn't clarify "the authors" beyond doubt, it's probably safest to use "we" or "they" here.

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) …and this rate is depending on the…
2) …and this rate depends on the…
3) …and this rate is dependent on the…
(Answers: 1) Incorrect; 2)/3) OK)

Author's Toolkit

Writing Better Technical Papers

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'Writing style' is that elusive quality that adds *feeling* to the text beyond the *meaning* of the assembled words. Should you try to inject style into your research paper? The answer to this is not a simple yes or no.

Putting 'Style' in Your Paper?

Many books have been written about writing style: what it truly is, how to achieve it, how to improve it. Advanced university courses are devoted to it. Certain writers, especially novelists, are widely praised for their writing style. Reading a work written in an innovative and unique style can be, at least in my view, more stimulating than watching a Hollywood blockbuster movie stuffed with exploding CG.

But in a technical/academic paper?

When I rewrite a paper in which the author attempts 'style,' my decision to keep or delete it is based on the respective answer to this question: Does the style help or hurt the paper?

In most cases where I let the style stay, the author appears to have a near-native grasp of English.

A submission I recently reviewed described the work's problem/solution efforts in a way that was like a crime drama; it was an unusual approach but well done aside from some simple grammar problems, so I evaluated it highly.

On the other hand, authors often suddenly insert a 'stylistic' expression in the middle of plain descriptions, as in this recent example:

× Lucky for us, the sample maintained its...

This expression contrasted starkly with the surrounding text, so I suggested the calmer

○ Fortunately, the sample maintained its...

As seen in the above example, random "casual" expressions often involve using the first-person plural ("we"/"us"), where it's not clear whether "we" means the authors or the authors *and* the readers. Consider this:

× So we may say that the enhanced version is...

Aside from sounding a bit boastful, this expression's casual tone clearly sounds out of place, unless the author *consistently* and *naturally* maintains such a tone throughout the document. A more neutral version of the above:

○ Therefore, it is reasonable to assume the...

So should a non-native technical writer give up the idea of using writing style in English? No. Your default style should be short, clear sentences written mostly (but not always) in the active voice with the main verb near the beginning. From this solid base, with time and experience, you can start developing your style.

A piano student should not try to tackle Rachmaninoff before she has mastered "Twinkle, Twinkle Little Star."

Don't Clutter Your Conclusions

Your "Conclusions" section should be a short, clear review of the paper's purpose, methods, major results, and significance, with *possibly* a very short preview of future work.

If you go beyond this simple but important task, you are probably overstuffing, and thus weakening, your Conclusions.

Do *not* include references to sections or graphics in your paper or to other papers. Do *not* extensively list results or describe methods in minute detail. "Future work" descriptions should be minimal.

A Conclusions section must briefly highlight what is *important*; repeating minor details lessens the impact. This ideal format requires the writer to be very *selective* in choosing what to include—a job to take seriously.

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) ...until the sample reached to 153°C.
2) ...until the sample reached 153°C.
3) ...until the sample reached up to 153°C.
(Answers: 1)/3) Incorrect prepositions; 2) OK)

Author's Toolkit

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In writing, words are the basic building blocks used to present *ideas* in a form that can be understood and distributed. A single *idea* is normally embodied in a structure of words called a sentence; related ideas are then structured into a *topic*, written as a paragraph.

Paragraph Power: Use It!

Paragraphs play a key role in clarifying a document's ideas, since they show which ideas (sentences) belong together, the order of ideas within each topic (paragraph), and the order of topics within the paper or a major section of it.

Non-native writers of English produce three main kinds of bad paragraphs: too short, "semi-paragraphs," and too long.

The first type of bad paragraph is not so common in technical or academic papers but often appears in other types of documents like manuals, reports and proposals. If paragraphs are only a single sentence, it is difficult for the reader to understand which ideas belong together, thus hurting overall readability.

In some cases, authors of tech papers start a whole new paragraph for a short sentence that introduces a list, equation, or table. This is usually unnecessary when such content is closely related to the preceding paragraph.

A "semi-paragraph" (my own term) appears most often in correspondence, especially e-mail, where paragraphs are separated by a line space made by two returns. This non-paragraph occurs when the writer begins the next sentence on a new line but doesn't really start a new paragraph with a space above it. Such formatting not only looks bad but also reduces clarity by losing the power of a real paragraph.

In technical papers, the biggest paragraph problem is big paragraphs. Having only two paragraphs in the Introduction, for almost all IEICE papers and even most IEICE letters, is simply bad formatting.

A typical case of "overweight" paragraphs involves describing previous works that have attempted similar studies to your paper. Generally, the various approaches can be grouped into rough categories: References [1–5] used A method, [6, 7] used B, and [8–10] used C. You can either write about all three methods, i.e. ten previous papers, in one huge paragraph *or* divide the approaches into the main methods, for three manageable paragraphs.

Of course I recommend the latter style. A paragraph that goes on for most of the length of a column not only seriously hurts readability but also discourages the reader from reading.

Making the effort to break up huge paragraphs is work that is well rewarded. Your ideas become better organized, connections become clearer, and key points become easier to spot. In short, your readers win.

Attracting "interest" & "attention"

In promoting an issue's importance, usually in the Introduction section, a useful technique is to mention that it has attracted much "interest" or "attention." In such expressions, never use the plural form of these words:

✕ Many researchers have shown interests in...

〇 Many researchers have shown interest in...

Another error is to miss the subtle distinction between "pay attention" and "give attention":

✕ ...also paid attention to preprocessing the...

〇 ...also gave attention to preprocessing the...

These are nearly the same: Both convey "carefully observe," but "give" additionally implies subsequently doing something.

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) From this reason, we decided to...
2) For this reason, we decided to...
3) From these results, we decided to...

(Answers: 1) "For this"; 2) OK; 3) OK)

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Author's Toolkit

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One of the most difficult areas of English writing to understand—and to explain—is article (a/an/the/no article) usage. Let's take a look at some specific problems with "the."

Special Problems with "the"

The concept expressed by "the" is simply not expressed by a corresponding word in many languages. For those raised in such "non-the" languages, this creates a significant challenge in writing technical papers in English.

Here, I'd like to discuss three particular problems involving "the" in technical writing.

1) Introducing the current paper's research

A common problem I've encountered when reviewing technical papers is the use of "the" to introduce this, the current paper:

× This paper presents the new method to...

○ This paper presents a new method to...

Logically, the method is being *introduced* for the first time, so "the" would incorrectly suggest something already known to your readers. However, in subsequent sentences, "the" is entirely appropriate:

○ ...a new method to align signals. The method uses a routing process that...

Use this "introductory the" at the proposal's first mention in the Abstract/Summary, Introduction, and Conclusions sections, since each of these parts introduces your new idea.

2) Describing "performance" in general

When you are describing a general change in *performance* due to some effect or action, "the" is not needed:

× ...and this greatly increased the efficiency.

○ ...and this greatly increased efficiency.

× It improved the durability in rough terrain.

○ It improved durability in rough terrain.

× ...and decreased the robustness to friction.

○ ...and decreased robustness to friction.

However, if the performance is *specified* by "of" or possessive use, then "the" is correct:

○ ...and increased the efficiency of the node.

○ ...and improved the casing's durability.

3) Using proper nouns, especially possessives

When you use a name as a noun in your sentence, "the" should generally not precede it:

× This conference will be held in the Osaka.

○ This conference will be held in Osaka.

When a person's name is used as an adjective for a concept, such as a theory or principle, use *either* "the" before the name *or* the name's possessive (by convention), but not both:

× This is supported by the Hosoda's theorem.

○ This is supported by the Hosoda theorem.

○ This is supported by Hosoda's theorem.

Using articles remains difficult even after learning "rules." Experience from reading scientific articles or living in a native-speaking environment can be helpful, but always think before using, or not using, a/an/the.

Challenged by "Challenge"

The word "challenge" is more likely to be used, especially in business writing, by non-native than by native English speakers. The word is fine when carefully used as a noun:

○ We took on the challenge of blind sensing.

On the other hand, as a verb it sounds strange because this usage typically involves an invitation to an old-fashioned man-to-man fight:

○ I challenged Lord Farquhar to a duel after his indelicate comments about Lady Ashdown.

× We challenged the difficulty of blind sensing.

A simple rule for "challenge" in modern technical writing? Just don't use it as a verb.

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) Our lab studies many advance technologies...

2) Lab purchases require advanced approval...

3) Purchases must be approved in advance...

(Answers: 1) "advanced"; 2) "advance"; 3) OK)

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In the hot months of summer, most Japanese firms have sensibly introduced "Cool Biz" dress codes that relax the need for suits and ties. But let's not get laid-back in our technical writing.

Don't get too casual...

Let's face it: Most technical papers are aimed at publications that generally take a serious approach to serious issues. If the writing style has the casual phrasing of an e-mail between old friends, the reader may be distracted from the paper's problems and solutions.

A common type of over-casual language involves expressions of large quantities:

✗   A lot of previous research efforts have...
✗   Lots of previous research efforts have...
✗   Plenty of previous research efforts have...
○   Many previous research efforts have...
○   Several previous research efforts have...

Expressions giving additional information can also be too casual:

✗   By the way, we should also consider...
○   Another important consideration is...
✗   Besides, the cooling rate influences...
○   Furthermore, the cooling rate influences...

Be careful in introducing consequences:

✗   So we can say that...
○   Therefore, we can assume that...
✗   As it turns out, the highest level is...
○   As a result, the highest level is...

Don't be too breezy in giving permission:

✗   It's also OK to use histidine for the...
○   Histidine may also be used for the...
✗   It doesn't matter which node is used to...
○   Either of the nodes can be used to...
○   Any of the nodes can be used to...

Avoid using conversational expressions when beginning to give reasons:

✗   To begin with, there are not enough...
✗   First of all, there are not enough...
○   First, there are not enough...

Sometimes multiple-word verbs (phrasal verbs) sound too conversational:

✗   It's very important to get rid of the ambient noise that exceeds this threshold.
○   It's very important to eliminate the ambient noise that exceeds this threshold.
✗   Next, we pick up all of the t-test results that satisfy our three basic criteria.
○   Next, we select all of the t-test results that satisfy our three basic criteria.

Finally, it's important to remember that casual or conversational language does *not* mean simple, clear, and short language, which is of course best for technical writing.

Multi-purpose PowerPoint by Reduction

PowerPoint presentations should use the bare minimum of text, and this is also true of displayed posters presented in a poster session. Words should not block the flow of ideas. Slides and posters benefit from relaxing white space.

On the other hand, *documents* that you hand out to audience members will be read later, at the individual's pace, and thus can be full of detailed explanations and examples.

In addition to, or instead of, copies of full papers, it's useful to distribute extra-dense PowerPoint handouts with both images and text. But instead of building these up from the original slides/poster, consider *tearing down* the handouts, by carefully reducing text, to make clean, attractive slides and posters. This process makes you consider what is truly necessary to show in your real-time presentation.

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) We seek after a new solution to faulty...
2) We seek a new solution to faulty...
3) We seek for a new solution to faulty...
(Answers: 1) & 3) incorrect; 2) OK)

Author's Toolkit

Writing Better Technical Papers

Ron Read

Kurdyla and Associates Co., Ltd.

In writing, the words we choose to use make a difference. Let's take a look at some words that are often poorly chosen in IEICE submissions.

Choose Words Carefully

The first group of tricky words includes pairs that have very similar spelling and pronunciation, causing even native English speakers to chose the wrong one. These are frequently very useful verbs:

× We *adapted* a new method to...

× We *adopted* the standard method by...

× We need to *assess* the remote database.

× After this process, we will *access* the results.

× Temperature can *effect* its stability.

× This change can *affect* a related response.

For each of the three pairs above, the similar words should be reversed to fit the context. Remember: *adopt* means to use, *adapt* means to modify, *access* means to get to, *assess* means to evaluate, *affect* means to influence, and *effect* means to cause (the latter is rare; also, as nouns, *effect* means a result and *affect* means an emotion in psychology, again the latter being rare—easiest solution in 99% of your writing is to just use *affect* as a verb and *effect* as a noun).

Similar to the above pairs is confusion of its/it's, there/their/they're, purpose/propose, and ensure/assure.

Another source of poor word choice is using a word that *roughly* conveys your meaning but is somehow unnatural, probably due to overly direct or imprecise translation into English from one's native language.

In stating a belief, assertion, conclusion or argument, the verb "claim" is often misused:

× We *claim* that the actual cause is the...

○ We *believe* (*assert/suggest/found/ conclude/are confident*) that the actual cause is the...

For this purpose, "claim" seems too defensive or confrontational, with a hint of legalism. The same kind of misusage is also found in expressions with the word "insist."

Another word usage in papers that seems odd to me is "decide" with a non-human subject:

× The resulting value of the above equation *decides* the amount of applied voltage.

○ The resulting value of the above equation *determines* the amount of applied voltage.

The first sentence is not strictly wrong, but in technical writing it's best to restrict "decide" to decisions taken by people.

The word "with" tends to be used incorrectly to connect actions that are done simultaneously:

× Our robot lifts the elderly person *with* moving gently away from the bed.

○ Our robot lifts the elderly person *while* moving gently away from the bed.

Better *word choice* makes your writing shine!

Maybe, Perhaps, a Bit Too Tentative?

Authors can sometimes be extremely cautious in making assertions, which is similar to the idea of "hedging your bets"—not going one way or the other.

While no one wants to be caught making a wild, unverifiable claim, it's also not good to be excessively tentative or conditional:

× This method can be applicable to other...

○ This method can be applied to other...

○ This method is applicable to other...

× We hypothesize that it may be due to...

○ We hypothesize that it is due to...

○ We conclude that it may be due to...

Keep your uncertainty to a reasonable limit!

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) The sensor is located in the T3 circuit...

2) The sensor locates in the T3 circuit...

3) The sensor locates errors in the T3 circuit...

(Answers: 1) & 3) OK; 2) incorrect)

Author's Toolkit

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Publishing in a recognized journal is an important career achievement for researchers in academia and industry. In this process, good communication with editors and reviewers deserves your attention.

Responding to Reviewers Effectively

For famous and thus highly selective publications, the review process requires you to respond to points raised by reviewers (or 'referees') of your manuscript, especially when you must write in a second language.

Actually, I frequently rewrite such responses (and sometimes the reviews) for my clients. Let me share some simple techniques to make your correspondence with editorial staff smoother.

Begin your message in a friendly, but not excessively fawning, way:

○ We would like to thank all of the reviewers for their helpful comments.

✕ We are so happy to have received all of your wonderful and inspiring ideas!

Respond to *all* of the points raised, 'major' and 'minor.' Neglecting any point raised may give the editor the impression you were careless, didn't have an answer, or dismissed the point.

Respond *directly* to the points raised, with minimal explanation. Giving a great deal of related but non-critical background info will most likely just annoy busy reviewers.

You will almost never help your case by being overly defensive or argumentative when a reviewer raises a disagreement about your approach, understanding of previous work, or conclusions. Keep in mind that the editor carefully selected the team of referees, so their views will be taken seriously.

If you do feel that a referee did not have a proper understanding of your paper from his or her comments, by all means point this out but do so *diplomatically*:

✕ The referee clearly does not know very much about this new technology for...

○ It seems that the referee isn't quite familiar with the recent findings on this. Let me try to clarify this issue.

For very simple points of grammar, formatting, etc., you only need a brief note:

○ This point was revised according to the reviewer's advice.

When indicating the locations of changes by page and line number, clearly inform the reader whether you are referring to the previous or the revised version of the manuscript.

Finally, remember that the editor is very concerned with making sure your paper is published in the best possible form. If you work with your editor and referees as a collaborator rather than as an adversary, the publishing process will be more enjoyable and your finished article will look better in print.

PPT: If you don't say it, don't show it!

As I mentioned in a column last year, it is very important for presenters to carefully coordinate what they say with what they show in their PowerPoint slides' text and images.

A problem I've noticed more frequently is presenters adding information to slides that is not even mentioned, or simply mentioned with a phrase like "Please look at this list."

Maybe such a presenter is trying to "sneak in" info that he or she does not have time to talk about? Consider the reality: No one is going to read, let alone remember, unspoken ideas in text or images. On the contrary, 'extra' slide info is 'noise' that will confuse the audience!

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) This paper presented the new method for...
2) This was done under an assumption that...
(Answers: 1) a new method; 2) the assumption)

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Prepositions—those little words like "of," "in," "on," "for" and "by"—work as supporting players in sentences to focus the meaning of the major players (verbs and nouns). Their proper use can be tricky, and errors here can seriously damage the understandability of the text.

Suppressing Superfluous Prepositions

A daunting challenge is first to choose the correct preposition for your intended meaning. Consider these two simple expressions:

- Then the volume dropped *to* 30 ml.
- Then the volume dropped *by* 30 ml.

The only difference between them is the choice of a little two-letter preposition: The first indicates the final level after the decrease, the second the amount of decrease.

Some common words for communication take a preposition as a noun but not as the equivalent verb:

- × We then explain about our method for...
- ○ We then explain our new method for...
- ○ Section 4 gives an explanation of the...
- × We then describe about its structure in...
- ○ We then describe its structure in...
- ○ Section 4 gives a description of the...
- × We then discuss on the results of the...
- ○ We then discuss the results of the...
- ○ Section 4 offers a discussion on the...

A similar problem arises when an incorrectly added preposition 'doubles' the function of an adverb in an expression:

- × In generally, such effects only appear when...
- ○ Generally, such effects only appear when...
- ○ In general, such effects only appear when...

When a verb indicating an "about" relationship is written as an "~ed" participle after the "be" verb, it typically takes a preposition, but this is not the case when it functions as a normal verb:

- × This issue concerns with the application of...
- ○ This issue concerns the application of...

- ○ This field is concerned with the use of...
- × Steganography involves in many factors
- ○ Steganography involves many factors
- ○ Many factors are involved in Steganography

Some preposition usage is not strictly wrong but still logically weak due to repetition of part of a verb's meaning. The preposition "into" is a classic example of this:

- +/- This variable in integrated into the design...
- ○ This variable in integrated in the design...
- +/- A margin is incorporated into the region...
- ○ A margin is incorporated in the region...

Finally, some verbs of motion seem to call for a preposition when it's not logically needed, even though native-English speakers make such statements in casual conversation:

- × Then the signal enters into the next node...
- ○ Then the signal enters the next node...
- × After the signal leaves from the node, it...
- ○ After the signal leaves the node, it...

Use prepositions with care!

Figure Captions: Keep them brief!

A figure caption's job is fairly simple: What does this graphic image show the reader? Most of the 'story' is already told in a well-prepared figure, so minimize the caption's text while still clearly describing the figure to the reader.

Consequently, a figure caption or table title need not always be a complete sentence:

- × This bar chart shows the dispersion of the...
- ○ Dispersion of charged particles after...

Let a figure or table tell its own story!

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) ...real world testing at high-speed.
2) ...high speed testing in the real-world.
(Answers: 1) ...real-world testing at high speed.
2) ...high-speed testing in the real world.)

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About five years ago here I wrote about the significant power of pronouns: using "it" or "they" not only saves words but, more importantly, avoids the risk of your reader missing the connection between a "thing" used in one sentence and the same "thing" used in the next one. This strength also applies to pronouns for people, but there are a few more complications in using such personal pronouns.

Your Own Personal Pronoun

The first common problem is a fear of using "We" due to an outdated "rule." Every important journal in English contains excellent papers using "We" at the head of a sentence. This is particularly useful for avoiding awkward passive-voice expressions:

× Both nighttime light, including shadows and lunar glare, and motion, such as that by nocturnal animals, could be monitored.

○ We could monitor both nighttime light, including shadows and lunar glare, and motion, such as that by nocturnal animals.

Naturally, you should not *overuse* "We"—such as at the head of several consecutive sentences—or strictly avoid passive-voice sentences. Just don't fear "We."

A second problem is the now decades-old issue of gender bias: should we use "he," "she" or "he or she"? This can get sticky.

This is easy if all of your subjects are male (female): when you discuss a subject in general, just use he (she). When the subjects, users, involved persons, etc. can be of either gender, then you have to decide on a strategy.

Only using "he/his" for a "generic person" throughout your paper is not really acceptable these days. A viable solution is "he or she," but if excessively repeated, this can seem awkward. Using "they" for a person is sometimes reasonable, but it seems odd for a human action or state that is highly individualistic.

One solution that is particularly effective is to use "he" for one experiment, condition, or observation and then "she" for the next one, alternating their usage throughout your paper.

The solution you choose will depend on your content and how you write about people, but do not forget that humans come in two genders.

A question raised by many of our clients is the use of "We" or "I" in referring to a *single* author. This is a rare problem, since most modern research is done through collaboration. Some consider "We" a bit old-fashioned or illogical, while others consider "I" arrogant-sounding or overly personal. One solution is to check single-author papers in journals where you want to be published. Generally, however, it's probably safest to use the editorial "We" for me.

Don't Write Skimpy Summaries!

Recently, I've noticed extremely vague summaries (abstracts) in many manuscripts submitted to IEICE as papers or letters.

A summary should be concise and direct, *but* it must also touch on the problem, method, results and significance in concrete expressions:

× We use a novel encrypting method.

○ We use an encrypting method based on...

× Then, we obtained many interesting results.

○ Consequently, we found that...

Your summary or abstract should not be a "teaser" for a mystery story but rather a simple and clear roadmap to your paper. Let your reader know what he or she is getting into!

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) ...by Mass Ray Scan (MRS for short).
2) ...Scan, which is often abbreviated to MRS.
(Answers: 1) ...by Mass Ray Scan (MRS).
2) ...Scan, which is often abbreviated as MRS.)

Author's Toolkit

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The first thing about your paper that a reader—or, more precisely, a potential reader—notices is its title. The title's importance in attracting rather than discouraging readers should not be neglected.

What's in a Name?

Your title is like the name of a paper in many respects. It's at the head of the page, it's listed in tables of contents and indexes, and it's the basis of the reader's first impression of the text.

The two important benchmarks of a good title are *short* and *descriptive*. It should be short so that your reader is focused on the key idea and novelty of your paper. It should be descriptive so that the reader knows what's inside the paper.

Consider these examples:

- ✕ A New Report on Ways to Control Outlier Propagation by the Use of Inference Coding of the Data Involved in Experiments
- ✕ Outlier Propagation Control
- ◯ Controlling Outlier Propagation by Inference Coding

The first example contains unneeded expressions: "A New Report on" and "Data Involved in Experiments." Other common unneeded expressions include "A Study on," "Investigations into," and "A Proposal for." Furthermore, don't "add on" information that really doesn't belong in the title: "...and Our Evaluation of the Method's Effectiveness"—of course the reader expects you to evaluate your method's effectiveness!

The second example above is certainly much shorter than the first, but it is so overly general that it gives the reader little help in understanding the paper's contents.

The third example finally does a good job of keeping the title short while also giving sufficient information for understanding the paper.

In the IEICE paper/letter format, this is how

I quickly judge a title: using no more than one line indicates that it might be a good title, unless it's too general; using one and a half lines means maybe OK; using two lines means the author should consider shortening it; using more than two lines means rewriting of the title is definitely in order.

Please give the wording of your title some time and consideration: It's your paper's proud flag!

And Don't Forget Section Titles

The titles of your main sections and their subsections also deserve some careful consideration. Like titles in general, the key concepts are "short" and "descriptive."

Journals will often give detailed instructions on preparing section titles, and you should first of all conform to them. A key consideration is *consistency* of style among these titles, especially when they are grouped together:

- ◯ a. *Analyzing shape data*
- ✕ b. *How to predict shape contour*
- ◯ b. *Predicting shape contour*

A very common problem with section titles is the use of unneeded words, particularly "the":

- ✕ a. *The advantages of the proposed method*
- ◯ a. *Advantages of proposed method*

Keeping the titles within your paper short, descriptive, and consistent will greatly help to guide the reader smoothly through your content—and this is the main job of titles!

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) ...was done with assuming that...

2) The material can be strengthened by combining with a new...

(Answers: 1) ...was done while assuming that../...was done with the assumption that... 2) ...by combining it with...)

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Poster sessions were originally intended to offer those people not accepted as presentation speakers an alternative way to present their research. Now, however, they are a major part of most academic conferences.

Give Your Posters Power!

Presenting a poster differs from giving a session presentation in several respects. Most importantly, 1) you are engaging in a conversation with another individual and 2) you use only one "visual" instead of many slides.

In explaining your poster, be sure to talk *with* rather than talk *at* the visitor. Greet the person in a friendly way and try to get an idea of his or her familiarity with your field—this valuable information is your first hint of whether to give a detailed talk or a broad overview.

Don't memorize a line-by-line speech of your entire poster; think of each major section (introduction, methods, results, conclusions) as a "module" that you can explain clearly. Especially if your visitor seems to be in a hurry, put emphasis on your major conclusions.

A poster session can impose intense demands on your interpersonal skills—for example, when you need to deal with multiple visitors or when a visitor is very critical or unclear in his or her comments. Be flexible, be sociable.

The second major challenge is preparing your poster. The biggest mistake is cramming too much detail into the poster, thus discouraging visitors from reading it or even stopping. Giving detail is the job of your *handout*, usually a copy of your full paper or other supporting document.

After making sure that your poster conforms to the conference's guidelines (outer dimensions, required contents, etc.), think creatively.

Make sure your title is short, clear and attention-grabbing. All text should be large enough to read comfortably from at least a meter—don't make your visitor bend down to the ground. The sequence of the parts should be easy to follow, using good placement of sections, arrows, or numbering in section titles.

"White space," or blank areas, is very important for making the poster appealing and easy to understand. Use color, photos, graphs, and drawings strategically.

Always remember that your poster is taking the visitor's valuable time—don't waste it. And of course you are "competing" for attention with many other posters.

Practice, Practice, Practice

Would you take a dive into the sea—or even a deep swimming pool—if you had never swum a day in your life? Of course not! Making a presentation in a second language may not risk fatal consequences, but it certainly has an important role in promoting your research.

Don't live dangerously: Practice your presentation many times before your performance. In my own training services (poster sessions as well as presentations), I've called this "rehearsal for life."

Ask a native-English speaker to join your practice audience, ideally a professional presentation trainer. Ask your collaborators to prepare several realistic questions in English but, importantly, not to give you the questions until the simulated Q&A session—you need to practice dealing with surprises.

Everyone "fails at first"—that's only human. The key is to make sure your actual presentation, with an actual audience of colleagues, is *not* your "first time."

English Usage Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) This has attracted the attentions of many...
2) This has attracted the interests of many...
(Answers: Both incorrect plurals: Always use singular "attention"/"interest" in such phrases.)

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In the last issue, I discussed the basics of preparing PowerPoint slides: Enliven *your story* with a few well-chosen words and graphics, don't just shine a journal article onto the wall! Now, let's talk a bit about *presenting* itself.

Present Your Research by *Connecting*!

Over the years, I've observed presentations by hundreds of non-native English speakers. Several common problems tend to reduce the impact of these presenters, thus ruining the opportunity for them to tell their story:

· Looking at the screen, their computer, the ceiling, the wall, their shoes, *anywhere but* the audience, the people waiting for the story.

· Standing and speaking with nearly *zero energy and enthusiasm*, as if they can't wait to finish, leave, and collapse in a chair.

· Letting nervousness overcome them and cause distracting quick steps, head scratches, laser waving, and very long pauses.

· Over-using a laser pointer; "karaoke-style" pointing at text is *not helpful* but annoying—I can read much more quickly than you can point.

· Worrying too much about including *every little detail* from their paper or conference proceedings, getting stuck on the "little stuff."

There are no easy magic solutions to these problems, but let's consider them one by one.

Look at your audience. A modern professional, whether in research or sales, must become comfortable with maintaining eye contact with other humans. There are only two reasons to look at the screen: getting your next idea for what to say and, much less common, pointing precisely at detailed graphics.

If you do not express an attitude of "excitement" about your work, you cannot really expect to ignite the interest of your audience. Being energetic and truly engaged in the presentation is the best way to say, "This is important!"

Nearly everyone experiences nervousness when speaking before a group. But don't let nervousness take control; instead, *channel* nervous energy to clarify your speaking, to look at the audience as conversation partners, to have a little *fun*. "Own" your presentation.

Minimize your pointing—only use the laser when it *really* helps the audience. Good use of animation can easily eliminate the need for any pointing at text. "A little" pointing is powerful.

Your presentation task is not to convey every fact about your work but to "sell" the audience on its importance and value for later consideration. To "fully inform" is an impossible mission; to "raise interest" is doable.

Supporting Documentation

Technical and academic conferences typically publish conference proceedings that include the full text of presented papers. Consider this a powerful tool that allows you to *avoid squeezing* every little detail into your talk and slides.

But even in more casual technical meetings you can gain this advantage by making a "double set" of PowerPoint (Keynote) slides.

Fill your first slideshow file with details: raw data, findings written out in full sentences, more detailed graphics, reference sources, etc. This will be printed and distributed to audience members as a *reference sheet* for later review

Then "save as" this file to a *presentation version*. Now start *massively cutting* detail while keeping what is *really important* for telling your story, adding helpful animation and enlarging certain areas as needed.

English Usage Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) As regarding the second factor, we. . .
2) This effect is confined to only the. . .
3) This effect is found only in the. . .

(Answers: Delete 1) "As" and 2) "only"; 3) OK)

Author's Toolkit

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The dramatic proliferation of technical and academic conferences in recent years has meant that researchers are increasingly writing not only for the printed pages of journals and proceedings but also for the "big screen."

Making Your Points with Power

Since the 1990s, the combination of constantly improving image projectors and presentation software has been the driving force behind the organization of conferences and the delivery of talks. PowerPoint (or Keynote) gives a presenter enormous power, but like all power, it can be used or abused.

A basic consideration, all too often neglected, is that a slideshow functions as an *explanatory tool*, not as a document. That is, your text and graphics (or sound and video) are presented temporally to reinforce the ideas you're expressing now, not for later reference.

In practice, this means that words on slides should be kept to a bare minimum: use very short phrases rather than full sentences. Remember that your audience has a limited ability to remember—dramatic concepts will resonate in our minds, full paragraphs of text will be forgotten in minutes, if not seconds.

Here's a simple example of minimizing text:

× · We also explored the room-temperature crystallization of our polarizing film.

○ · RT crystallization of polarizer

The text you include on a slide should not be sentences for the audience to read (if they can manage to stay awake) but short words linking what you are saying to what you are showing.

Use a simple, plain background. Light colors like white are generally best, though sometimes a tasteful dark gray gradient looks nice. Avoid background templates with elaborate designs or dramatic colors. Contrast is important: dark text on light backgrounds, light text on dark backgrounds. Do your final editing with a projector—don't expect to fully replicate what's on your computer's high-quality monitor.

Consider the timing of your delivery as you prepare the slideshow. You shouldn't spend a very long time in discussion of a single graphic. A more common problem is quickly racing through several complicated graphics much too quickly, thus not giving your audience time to understand the meaning of each graphic. If you can't spend at least a few seconds on an image, delete it.

Using animation to present text and graphics in sequence can reduce or eliminate the need to use a laser pointer. But don't use animation that is simply distracting without any benefit.

In preparing your slides, never forget that less is usually more.

Attributions on Slides?

Many presenters include bibliographic attributions inside their slides, such as "(D.L. Johnson et al., 2006)" written under a theorem name or equation. But is this really necessary?

In some cases, your organization or the conference you're attending may have strict (though perhaps archaic) rules about such on-screen attribution. But usually such notation does not add to the audience's understanding of the presented info.

You can *say*, "This equation, derived by Johnson and his colleagues a few years ago, gives a different solution to the..." And of course you should provide full and proper attribution in the *paper* accompanying your presentation.

English Usage Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) Many of samples were...
2) Many of the samples were...
3) Many samples were...

(Answers: 1) incorrect; 2) and 3) OK)

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It has been said that the American and the British are "two peoples separated by a common language" (this is variously attributed to George Bernard Shaw, Winston Churchill, and Oscar Wilde). In this issue we take up the matter of "American English" and "British English."

Red Coats, Blue Coats

Over the years, many of my clients and writing students have asked me about the differences between British and American styles of English. My short answer is "It's *not* a big deal," but this is usually not satisfactory to the person asking me.

The issue is not so simple. *Within* each English-speaking country there are major variations in dialect and there are big differences everywhere between *spoken* and *written* English. So let's restrict ourselves to technical writing for publication

A somewhat significant difference is the relative pronoun used for a thing in a 'restrictive' clause. OK, let me simplify:

Br/AmE: The interface, which was designed for the elderly, features a simpler layout and...

BrE: The interface which was designed for the elderly features a simpler layout and...

AmE: The interface that was designed for the elderly features a simpler layout and...

The first example is *non-restrictive*, where the relative clause (", which was...,") simply *gives added information* about the interface; the second and third examples are *restrictive*, where the relative clause ("which/that was...") *identifies* the particular interface under discussion.

However, even this relatively clear difference is not black and white (it's gray, or grey): Americans often speak with "restrictive which" and some British writers use "restrictive that."

This brings us to the matter of punctuation with quotation marks. US publishers place commas and periods within quotation marks while UK publishers place them outside quotation marks, and there's a tendency for British to use single (') rather than double ("):

BrE: ... writers use 'restrictive that'.

AmE: ... writers use "restrictive that."

Another difference that sometimes arises is the verb agreement of collective nouns representing groups of people:

BrE: The committee are considering a new...

AmE: The committee is considering a new...

Some spelling differences also come up:

BrE: labour, centre, analyse, defence...

AmE: labor, center, analyze, defense...

However, I return to my original point: It ain't a big deal. A skilled, considerate editor will guide you to the preferences of his/her publication. You, dear reader, have much more important matters to consider: writing sentences that are short, clear, direct, correct, and interesting, regardless of 'national style.'

Intros Mirroring Abstracts

Authors frequently write exactly the same text for the abstract ("Summary") as for the introduction. This is not absolutely wrong, since typically the same key information is expressed early and the abstract is published separately from the rest of the paper, particularly online.

But to make a stronger, well-balanced paper, try to even slightly vary the writing. An abstract will use a more compact and direct style; the intro will flow at a more relaxed pace.

A little effort here provides great impact!

English Usage Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) This problem concerns with the new...

2) This problem involves in the new...

3) Mr. Tate is involved in our project to...

(Answers: 1) delete "with"; 2) delete "in"; 3) OK)

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In spoken English, it's more natural to say "It's raining in Osaka today" than "Rain is falling in Osaka today," or "There's a beer in the refrigerator" than "A beer has been placed in the refrigerator." In these cases, "it" and "there" serve as "dummy subjects," a grammatical tool that can also be useful in technical writing.

Dummy Subjects

The main use of dummy subjects is to simplify sentences that would otherwise have long, awkward subjects:

- ○ It is inconvenient to recalibrate the lens each time the gaze target changes
- ✕ Recalibrating the lens each time the gaze target changes is inconvenient
- ○ There is keen interest in the trend of mobile devices determining OS features
- ✕ The trend of mobile devices determining OS features has raised keen interest.

The above sentences using dummy subjects are significantly more readable, mainly because they follow the key writing principle of keeping the main verb early in a sentence.

However, writers often use dummy subjects where they are not really needed:

- ✕ It is a collimating lens which was used in our second experiment
- ○ A collimating lens was used in our second experiment.
- ✕ There are many techniques that have been used for this purpose
- ○ Many techniques have been used for this purpose.

The above sentences without dummy subjects are more readable because we can easily use clear, short "real" subjects in place of "it" and "there."

However, in some cases where we could easily make a sentence without a dummy subject, we may actually want to use it for *emphasis*:

- ? However, the third variable makes the critical difference.
- ○ However, it is the third variable that makes the critical difference.
- ? However, that approach has two problems.
- ○ However, there are two problems with that approach.

All four sentences are readable, but the ones using dummy subjects place extra emphasis on "third variable" and "two problems."

And so on, etc.

When we give a series of items, sometimes the entire set of items is too long to list out completely, or such a complete listing is really not so important in the context of what we are writing. There are two basic techniques for expressing the idea that the listed items don't make a complete set. The first is to *start* the series with a phrase like "such as," "including," or "these include, for example":

- ○ Recent approaches include prototyping, parallel imaging. . .

The second technique is to *end* the incomplete series with a phrase like "etc." or "and so on":

- ○ . . . parallel imaging, linear tracing, etc.

A *logic* problem arises when writers use *both* techniques in the same sentence:

- ✕ Recent approaches include prototyping, parallel imaging, linear tracing, etc.
- ○ Recent approaches include prototyping, parallel imaging, and linear tracing.

So just use one technique or the other.

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) We used multi-sensors to measure the. . .
2) We used a multi-sensor system to. . .
(Answers: 1) We used multiple sensors to. . . 2) OK)

Author's Toolkit

Writing Better Technical Papers

Ron Read

Kurdyla and Associates Co., Ltd.

Human beings typically perform routine actions at regular intervals, like flossing one's teeth before going to bed, and we call these habits. People keep good habits and, unfortunately, bad habits. The former can have a very good effect in one's writing pursuits.

Good Writing Habits

In this issue, we step back from grammar for a little bit to discuss a few basic—but too often overlooked—habits of careful writers.

1. *Proofread* everything you write

This simply means reading your document again, and again, after finishing the writing. Read it quickly (for flow), slowly (for errors), and from different perspectives, such as someone completely unfamiliar with your work. Writers neglecting this habit are simply irresponsible.

2. *Get input* from colleagues others

Writing in the real world is very often used to describe collaborative efforts, such as research. Just as collaboration strengthens the planning and execution of experiments, such teamwork can also benefit a document's writing. Don't be too 'proud' to ask for help.

3. *Plan* your paper before writing

Sophisticated objects such as electronics and buildings are not simply thrown together without forethought—they are planned. Planning is also critical to a well-structured document: What do you want to say? What data will you include? How will you order the presented info?

Some writers use "outlining" software, of varying complexity, for this task. But a blank sheet of paper, a pencil, careful thought and a bit of time will serve you equally well.

4. *Manage your time* in writing jobs

Writing is time-consuming, and there's no escape from that reality. People tend to significantly underestimate the amount of time a writing job will actually take. We figure that two hours should be enough to finish a small section of a paper; it takes us five hours. We're confident four days should be enough to draft a paper; it takes nearly two weeks. This is human nature, but the effects of rushing are often clear and damaging to the document.

Give yourself some "buffer" time—start the writing job early. If you *do* finish on time, sit back and drink a well-deserved beer.

5. *Be flexible* about making changes

A piece of real-world writing is not like a marble sculpture: It is alive and changes. If you think carefully about others' input, changes in conditions, and your own reflections, then revisions are always improvements.

Parenthetical Care

A common and useful tool in many kinds of documentation, including a scientific paper, is the pair of parentheses (i.e., the curved marks enclosing this explanatory comment).

This tool is used to insert detailed specifics (like dimensions), indication to supporting graphics/data (Fig. X), and various side notes to the main idea (actually, the most common use).

Parentheses are not difficult to use, but make sure your placement of parenthetical information does not hinder readability:

✕ The dimensions (2 × 3 × 7 mm) of the infuser were set based on...

○ The dimensions of the infuser (2 × 3 × 7 mm) were set based on...

The first example does keep the added info close to what it describes, but it breaks up the idea abruptly; the second example allows the reader to finish thinking about the whole idea.

Mini Quiz: What's Wrong?

1) This section explains about the...

2) Here, we describe about our new...

3) This concerns on the method used to...

(Answers: 1) & 2) delete "about"; 3) delete "on")

Author's Toolkit

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Something happens, and then something else happens as a consequence The notion of "cause and effect" is at the heart of scientific investigation and the scientific method itself—it's hard to imagine how a scientific paper could *not* discuss causes and effects.

Cause & Effect, Effect & Cause

Let's look at a few of the most common problems authors have in writing about causes. First, let's consider the use of "as" to mean "because," which strikes me as rather archaic usage. More importantly, it can easily produce an ambiguous expression:

? The color saturation increases as the aperture opens very quickly

In technical writing, the conjunction "as" is usually used in the sense of "when" or "while," not as "because" Therefore, it's safest to write this sentence in one of two explicit ways:

○ The color saturation increases because the aperture opens very quickly.

○ The color saturation increases during the rapid opening of the aperture.

Another problem is using "So" to begin a sentence that gives the result of the previous sentence. Here, use a conjunctive adverb:

✕ So the energy level showed a tendency to...

○ Therefore/Consequently/Accordingly, the...

In using "thus" within a sentence, the addition of "and" before it can help readability:

✕ ...pits formed, thus the surface regularity...

○ ...pits formed, and thus the surface...

Generally, "because" connects a 'result clause' to a 'cause clause':

○ A higher data transmission rate could be achieved [result] because the false positives were removed in the first stage [cause].

Alternatively we can reverse the order of clauses by starting the sentence with "because":

○ Because the false positives were removed in the first stage [cause], a higher data transmission rate could be achieved [result].

However, be careful not to start a *very long* opening clause with "because":

✕ Because a higher... which is also... in addition to being... was reached, we...

By the time the reader gets to the "we" result clause, he or she is likely to forget that the long clause was describing a cause! In such a case, put the transition between the cause and result:

✕ A higher... which is also... in addition to being... was reached. Therefore, we...

Above all, the cause-effect relationship should be immediately clear and unmistakable.

"Oh, one more thing..."

Recently, I've seen more instances of authors "tacking on" additional ideas in the Conclusions section, that is, adding information that did not appear in the earlier sections of the paper. This may include previous research (belonging in the Introduction) or discounted data (belonging in the Results); in a recent paper, I saw an alternative equation added to the Conclusions (of course belonging in the Methods).

The Conclusions section should not include, in principle, any idea, finding, or technique not introduced earlier in the paper. As an exception, it's OK to introduce "future work" at the end of the Conclusions, but—as I mentioned in an earlier column—this should be kept short.

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) This device is to detect low-frequency...

2) The threshold is to control the level of...

(Answers: (example revisions) 1) This device is designed to detect low-frequency... 2) The threshold is set to control the level of... [main point: Don't make "to" infinitive phrases "carry too much weight" in an expression's meaning!])

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In this issue we take up the important matter of *space*. Here, I don't mean the final frontier, the great emptiness beyond our planet, or what you may lack on the subway every morning; rather, I mean the humble bit of white space produced in your document by hitting the long middle key at the bottom of your keyboard.

Give Me Some Space

A space in English text is more than nothingness—it is quite meaningful! At the most basic level, we separate and thus identify words by inserting spaces between them. Let's discuss a few of the most common ways that spacing is misused.

One of the most common errors with spaces involves parentheses:

× . . . Burnbaum variable(BV)␣determines. . .

× . . . Burnbaum variable␣(␣BV␣)␣determines. . .

○ . . . Burnbaum variable␣(BV)␣determines. . .

Consequently, the rule here is very simple: *always* insert a space *outside* of parentheses; *never* insert a space *inside* of parentheses.

Another very common problem is not using a space between a value (number) and a measurement unit:

× . . . so its memory was increased to 500GB.

○ . . . so its memory was increased to 500␣GB.

Actually, the first example (with no space) is often used in popular magazines or on the packaging of products like hard drives. However, in technical writing for a journal, you should add the space. A major exception is for temperature values, such as a number followed by degree sign and C for Celsius:

× . . . the temperature dropped to 87°␣C after. . .

○ . . . the temperature dropped to 87°C after. . .

Similarly, the symbol for percent (%) should not have a space in front of it:

× . . . 75␣% of the n-gram results showed. . .

○ . . . 75% of the n-gram results showed. . .

Be careful not to insert a space between words, letters or numbers and common punctuation marks like commas, periods and colons:

× . . . as before␣, were divided into three parts:

○ . . . as before, were divided into three parts:

An error I often encounter in our clients' documents is the insertion of two spaces between sentences:

× . . . without modification. ␣We then. . .

○ . . . without modification. We then. . .

Such spacing is an old convention of the typewriter era. Word-processing software like MS Word makes beautiful automatic spacing after periods—using two spaces ruins this.

Limit "Figure-centered" Sentences

A common sentence style in technical writing is what I call "figure-centered sentences":

○ Figure 1 shows a schematic outline of our. . .

○ Equation 2 expresses the relationship of. . .

Such sentences can be useful and are often clear and direct, but if overused they make the text seem repetitive and thus boring. The easiest way to limit such usage is by enclosing the figure number in parentheses:

× Figure 3 shows the correspondence ratios for Experiment 2. They are clearly larger than. . .

○ The correspondence ratios for experiment 2 (Fig. 3) are clearly larger than those for. . .

In addition to avoiding awkward repetition, the style of the second example uses as the grammatical subject a thing or concept that is more important than a reference to a figure.

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Mini Quiz: What's Wrong?

1) Our results match to those of Jones et al.
2) Our results match those of Jones et al.
3) Our results show a close match to those. . .
   (Answers: Only 1) is *incorrect*)

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In writing technical/scientific information, a common task is to list the elements in a series. These might be reasons, examples, conclusions, or anything else forming a *series*.

Series: Your Ducks in a Row

A key principle in writing a series is to keep the elements similar in grammatical structure:

× ...attributes such as heat, the radiation it emits, vibration, and the stability it provides.

○ ...attributes such as the heat it produces, the radiation it emits, the vibration it generates, and the stability it provides.

○ ...attributes such as the resulting heat, radiation, vibration and stability.

The first example mixes simple nouns with longer phrases, while the second and third are internally consistent, providing "parallelism."

Another issue that frequently arises, even among native-English speakers, is whether to place a comma after the next-to-last item:

? ...factors of size, weight and density. [or]

? ...factors of size, weight, and density.

This "controversy" has generated a lot of unnecessary debate, since most reliable grammarians say either style is OK. My own preference is to not use the comma for simple nouns or noun phrases but to use it for longer phrases, especially with verbs, in a series:

○ ...factors of size, weight and density.

○ ...circuit can be used to test the detection mode before use, implement the actual detection, and send the detection results to the onboard database.

The first part of my rule of thumb is really not important for readability; however, I would strongly recommend that technical writers follow the second part, using a comma for longer phrases, because often the next-to-last and last items can be confused as the same idea, not distinct elements in a series.

Sometimes, a series is spread over an entire paragraph or several paragraphs. Typically, the series is briefly introduced and then each element is given greater elaboration:

Previous methods have encountered three major problems. The first is how to...

[after several sentences on the first problem...]

× The second is the time required to...

○ The second major problem is the time...

In the first example, readers may have lost focus on the series and ask, "Second what?"

Into the Future, Briefly

Many papers finish, either as a separate section but more commonly as the end of the Conclusions section, with a brief introduction of related "future work." This isn't required, but it can be helpful to stress the potential extension of the proposed approach to applications beyond that discussed in the paper.

When mentioning future work, be sure to also give a reason for it:

× Future work will include multi-user scenarios.

○ Future work will include multi-user scenarios to investigate the effects of collaboration.

Most importantly, keep the "future work" description *brief*—a short "teaser" is most appealing, and you don't want to detract attention from the current paper, which you just worked so hard to finish!

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) ...and those proposed by Dean et. al. for...

2) ...and those proposed by Dean et al. for...

3) ...and those proposed by Dean et. al for...

(Answers: For this Latin term meaning "and others," only 2 is correct; "et" is *not* an abbreviation but means "and," while "al." *is* an abbreviation for "alia," and thus only "al." has a period after it.)

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Technical and scientific documents often present a number of complex ideas, and thus an important writing task is to connect those ideas clearly and logically.

Connecting Correctly

Whether we are connecting full clauses (expressions with a distinct subject and a completed verb) or simply nouns like things, people and places, the words and punctuation we use have a significant effect on readability.

A "conjunction" is a word that can, as needed, connect all of the above items:

- ○ ...is attributed to friction *and* heat (nouns)
- ○ ...is static, *but* the outer ring is... (clauses)

In those sentences, no comma is used before the conjunction connecting nouns but one is used before the conjunction connecting clauses (except, as in this sentence, when the two clauses are short and tightly related).

Although not an ironclad rule, it's best to avoid beginning sentences with conjunctions, particularly "And," "But" and "So." But it sometimes adds *impact* in the right context:

- ✕ *And* another interesting idea is the fact that...
- ○ *And* then no further radiation appeared.

A similar but quite distinct type of connector is a "conjunctive adverb," such as "therefore," "however," and "furthermore." These words almost always connect two clauses, and they must be preceded by a period (for clauses as separate sentences) or a semicolon:

- ○ ...greatly decreased. However, the next...
- ○ ...greatly decreased; however, the next...
- ✕ ...greatly decreased, however, the next...

When such words separate parts within a single clause, however, they have commas on each side or, in the case of a very brief break from the main idea, no punctuation:

- ○ The results, therefore, supported our...
- ○ We therefore concluded that the...

Of course ideas can also be effectively connected using only punctuation, without connector words. Semicolons connect clauses with highly related ideas and thus show that relation, whereas colons connect clauses that have a consequential, or cause-effect, relation:

- ○ Many systems actually depend on this phenomenon; these include, for instance...
- ○ This raises a key issue: What kind of...

Colons can also introduce series of items:

- ○ This was done in three steps: locating, monitoring, and recoding.

However, don't use colons along with words that basically do the same job:

- ✕ The three steps include: locating...
- ○ The three steps include locating...

Slow-starting Abstracts

Lately, I've been noticing an increasing and disturbing trend in submissions to IEICE, as well as papers I edit for my rewriting business: *slow-starting abstracts*! What I mean here is that an abstract (or "summary") that starts with general background, previous work, or a broad generalization is weak and ineffective:

- ✕ Dynamic scene recognition is the field of...
- ✕ Many approaches in dynamic scene recognition have attempted to...

Such openings are in fact annoying to readers. They fail to immediately address the reader's question that an abstract must answer: Why should I read this? Use direct openings:

- ○ This paper presents a new approach to...
- ○ We develop a novel method of...

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Mini Quiz: What's Wrong?

1) Later, we discuss on the results of...
2) Later, we explain about the results of...
3) Later, we comment on the results of...
(Answers: 1 & 2: delete "on" & "about"; 3: OK)

Author's Toolkit

Writing Better Technical Papers

Ron Read

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Every language has little-used and complex features, and English is no exception. A classic example of this is the *subjunctive mood*.

Deep into the Subjunctive

A verb's *mood* indicates a deep sense of the context of its action. The most common verb mood is the *indicative mood*, which simply indicates how thing are:

○ Drying is carried out in a vacuum chamber.
○ Oxidation also contributes to decreased...

The *imperative mood* is used to issue a command or instruction, as in an algorithm:

○ Next, dry the sample in a vacuum chamber.
○ Do not enter!

A special mood is the *subjunctive mood*. Briefly, the subjunctive is used to describe situations that don't exist in fact, states that are hypothetical or imaginary:

○ If I *were* president of the company, I would invest more resources in research and...
✕ If I *was* president of the company, I would invest more resources in research and...

As in the above example, subjunctive expressions are often used in clauses introduced by the word "if." Although "were" here seems to be the plural past tense ('They were tired'), it has no such meaning.

Other common uses of the subjunctive mood are for subordinate clauses that express recommendations or requirements:

○ We suggest that the user first remove the...
✕ We suggest that the user first removes the...
○ We require that each employee wear a...
✕ We require that each employee wears a...

In the above examples, the normal "s" is removed from the verb, making it again appear to be the plural verb form, though it isn't. Another common subjunctive construction is made with the "root" form of "be," as in the following case for a request:

○ He asked that all employees be punctual...

✕ He asked that all employees are punctual...

In practical technical writing, the choice is sometimes tough between whether the indicative or subjunctive mood should be used. My own rule of thumb is to use the indicative for an action that is likely to exist, especially if it's independent of a decision, but the subjunctive for something that is only a supposition, especially if it involves a decision:

○ If the adhesive strength *is* too low, normal vibration *causes* the package to crack ...
○ If a less adhesive substrate *were* adopted, normal vibration *would cause* the package...

The distinction between these ideas is subtle: Is it likely in the real world or is it imaginary?

Reference Numbers in Text

Normally, reference sources are mentioned in the text either by the author's name or, more simply, within parentheses:

○ Blintsky et al. (5) proposed a hydrophobic...
○ A hydrophobic approach (5) was later...

However, the editors of most journals would not approve of the recent practice of treating reference numbers as grammatical entities:

✕ (5) proposed a hydrophobic approach to...
✕ ... and a similar approach was given in (5).

Put simply, don't use reference numbers as words. In some cases, it might appear disrespectful not to mention a name; in all cases, such style damages a document's readability.

Grammar Questions? read@kurdyla.com

Mini Quiz: What's Wrong?

1) The currently-used reactant is...
2) A newly-developed routing algorithm was...
3) In a recently-published review, Tesla said...
(Answers: 1: currently used; 2: newly developed [usually "new" is better]; 3: recently published; normal "~ly" adverbs don't need hyphens)

Author's Toolkit
Writing Better Technical Papers

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Technical papers evaluate, analyze, report, compare, quantify, measure, or any combination of these. Such writing tasks nearly always require the use of numbers.

The Numbers Game

There are many areas of number usage that involve careful distinctions; however, we'll just look at a few that cause the most common problems for writers of technical English.

The style guides of journals and technical organizations set out a variety of "rules" for when to write a numeral (e.g., 600) and when to write a number as a word (e.g., six hundred). A common and simple "rule of thumb" is to spell out single-digit numbers (one, two...nine) and write numerals for two-digit numbers (10...).

For numbers as values with standard measurement units, numerals should always be used:

× ...of the second sample was only three cm.

○ ...of the second sample was only 3 cm.

A numeral should never be used at the beginning of a sentence:

× 55 subjects participated in the trial of...

○ Fifty-five subjects participated in the trial...

However, starting a sentence with a very large number can be awkward and thus hurt readability:

? Nine hundred twenty-five responses were...

Such sentences should be *recast* so that the big number is not at the beginning:

○ We gathered 925 responses to our...

○ Among the 1,000 questionnaires distributed, 925 were answered and submitted.

Another simple technique to escape this trap is the use of a "filler" expression at the beginning of the sentence before the number:

○ A total of 925 responses were gathered...

○ In all, 925 responses were gathered...

When writing a series of counted objects, all of the counting numbers must match in style:

○ The TEM image reveals three Na ions, six Co ions, two In ions, and four Ar ions.

○ The TEM image reveals 18 Na ions, 14 Co ions, 22 In ions, and 11 Ar ions.

Consequently, when the counting numbers include both small and large numbers, all of them should be unified to numerals:

○ The TEM image reveals 3 Na ions, 14 Co ions, 2 In ions and 11 Ar ions.

Using "We"

Some out-of-date textbooks on technical writing strictly forbid the use of the personal pronoun "we" in papers to indicate the authors. However, nearly all *modern* technical societies and journals have no problem with *moderate* (of course not excessive) use of "we".

"We" can be particularly useful to avoid long passive-voice sentences:

× In this paper, a,...f, and g were analyzed.

○ In this paper, we analyzed a,...f, and g.

The first sentence requires the reader to read and absorb seven nouns or noun phrases before getting to the action, "analyze"; this is annoying because the reader wants to know the action *soon*. The second sentence establishes the action right away, so the reader can "mentally relax" and think about all those nouns.

Avoid using "we" in a way that makes the authors seem *self-important*:

× We, therefore, concluded that...

○ Therefore, we concluded that...

Mini Quiz: What's Wrong?

1) The remainder of the paper is organized as...

2) The remaining sections of the paper are...

3) The rest part of the paper is organized as...

4) The rest of the paper is organized as...

5) The remaining of the paper is organized as...

(Answers: 1: OK; 2: OK; 3: NG; 4: OK; 5: NG)

Author's Toolkit

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In elementary school, I had an excellent, if slightly strange, English teacher. She strictly forbade her pupils from starting sentences with three specific words: "And," "But," and "So." While this "rule" isn't—and probably shouldn't be—strictly enforced in modern publishing, it remains a solid standard for technical papers.

Starting Sentences with a Connector

One of the best ways to start a sentence is to connect it to the idea that came before. We do this within sentences using *conjunctions* like "and" for an additional idea, "but" for an opposing idea, and "so" for a resulting idea.

However, these words should be avoided at the beginning of a sentence in technical writing: They can make a sentence sound too casual or an idea too fleeting, even inconsequential. Such style may be fine in a novel or general-interest magazine, but in a technical paper 'style' should not diminish clarity and explanatory impact.

A "connecting" sentence opening is generally made with a *conjunctive adverb* or a similar phrase. For "And": "Furthermore, Moreover, In addition"; for "But": "However, Nevertheless, On the other hand"; for "So": "Therefore, As a result, Consequently, Accordingly."

When using such words as sentence starters, watch your punctuation. They should be immediately followed by a comma:

○ ...found the same results. Therefore, we...
○ ...found different results. However, we...

Sometimes these connector words are used within one sentence, joining two *independent clauses*. Here, they are preceded by a *semi-colon*, not a comma, and then followed by a comma:

○ ...found the same results; therefore, we...
✕ ...found the same results, therefore, we...

This usage is thus different from how we join clauses within a sentence using an ordinary conjunction:

○ ...found the same results, and we...
✕ ...found the same results; and, we...
✕ ...found the same results; and we...

The above function of connecting two clauses should not be confused with using words like "however" and "therefore" *within* a clause, between the verb and object or between the subject and verb. Here, such words are generally set off by commas, or sometimes used without punctuation:

○ ...We found, however, that these effects...
○ ...The parameters, therefore, were reset...
○ ...Users must therefore take care to...

Finally, the use of these three little words at the beginning of a sentence is not inherently evil. But usually such sentences I see are rather weak, especially those starting with "So." And as shown above, you have many alternative ways to begin sentences. So please think carefully when you're tempted to start a sentence with "And," "But" or "So."

Avoid "Say-nothing" Openings

Some authors have a tendency to begin major paper sections—usually the Abstract or Introduction but also sometimes the Conclusions—with what I call a "say-nothing opening." For example:

✕ In recent years, the Internet has become widely popular. This paper proposes a...

The first sentence really says nothing to any reader of a technical journal, and may strike some as silly, glib or even condescending. Start with the next sentence ("This paper..."), or any expression that is meaningful. Section openings should be short, strong and direct.

Mini Quiz: What's Wrong?

1) Most of subjects reported that...
2) At first, each voice sample was filtered with...
(Answers: 1: "Most of the subjects..." *or* "Most subjects..."; 2: "First, each voice sample was...")

Author's Toolkit

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We would all like our writing to seem up to date, with words and phrases commonly used in scientific discourse. But sometimes what I call "trendy" words are simply overused expressions that have come to lack impact and precision.

Trendy Words — but Maybe Overused?

Over periods of five or ten years, I've noticed that certain words have become more commonly used in technical papers. However, using such words excessively can sacrifice the clarity and expressiveness of your writing.

My opinion is admittedly rather abstract, so let me illustrate it with concrete examples.

The use of the word "enable" has increased substantially in recent years, becoming nearly a substitute for "allow" or "permit":

○ Our code permits a faster recovery time.

ok? Our code enables a faster recovery time.

I suppose the second sentence is not strictly wrong, but it does seem to break from the traditional use of this verb for introducing an infinitive phrase ("to" + verb):

○ This gauge enables the operator *to monitor* temperature and pressure simultaneously.

In other words, we usually express with this word *what* its direct object (person, thing) is now able to do. Its use without an infinitive phrase has generally meant, in a narrow sense, to make operational or active:

○ They enabled the laser defense system.

○ This step enables the start sequence.

Your writing will seem better structured when using "enable" with an infinitive phrase:

○ Our code enables the system to provide a faster recovery time.

A word that has an even longer history of excessive, perhaps careless, use is "realize." Traditionally, this mainly means "come to understand, comprehend," but in recent times its other meaning as "to effect, make, bring about" has become more widely used:

ok? Our tool realizes higher accuracy than...

ok? This method realizes better parts than...

Well, "realize" is certainly understandable in the above two examples, but it's a bit "fuzzy and weak." Better to use stronger, more direct verbs:

○ Our tool *achieves* higher accuracy than...

○ This method *produces* better parts than...

Another word being increasingly used in new ways is "enhance," which usually means "to make better" in a broad sense:

○ Good packaging enhances product appeal.

While the above sounds fine, in other cases the word conveys a "fuzzy" impression:

ok? This approach enhances accuracy...

ok? It's necessary to enhance resistance to...

While these expressions are understandable, better word choice adds impact:

○ This approach *improves* accuracy...

○ It's necessary to *increase* resistance to...

Use 1-Byte Fonts in English Text

Mixing two-byte characters into English text can cause trouble. To avoid giving your editor/printer headaches, always use a standard one-byte font, like Times or Century, when writing in English. Do *not* switch to a two-byte font to input characters like quotation marks, parentheses, degree signs, various punctuation marks, or plus/minus (+/−). All of the characters you need can be found on the keyboard or from "Special Characters" in your application's menus. If you must use some two-byte text, such as examples of machine language translation, make sure that the two-byte formatting applies *only* to that text.

Mini Quiz: What's Wrong?

1) Comparing with the conventional model, our proposed model shows better...

2) By comparing the two models, we found...

(Answers: 1: "Compared with"; 2: correct as is)

Author's Toolkit

Writing Better Technical Papers

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One of the most common tasks in technical writing is to indicate *quantities* of things. We often do this with exact expressions, such as "7.05 cm"; in other situations we can do this with general terms such as "a small amount of."

About how much?

In many situations, it's more appropriate to state an approximate quantity rather than an exact quantity (note that I did not start this sentence with "In 5,369 situations..."). English provides a rich variety of expressions to do this, but of course they must be used properly.

One of the key considerations in using such expressions is whether the quantified object is a *countable* or an *uncountable* noun:

× Many information can be obtained by...

× Much devices depend on volatile memory...

○ Much information can be obtained by...

○ Many devices depend on volatile memory...

A further distinction is whether the expression indicates a large or a small amount. One of the most common errors is confusing the word *several* with *a few*. Actually, *several* means a rather large amount, a bit less than *many* but definitely more substantial than *some*. Therefore, never use *several* for a minimal or decreased amount:

× We only found several problems in the...

× It decreased to several outliers after...

○ We only found a few problems in the...

× It decreased to a small number of outliers...

Another common mistake is not understanding the apparently tiny but actually huge difference made by adding or not adding "a" before the words *few* (for countable nouns) and *little* (for uncountables). By using "a" we are simply stating that a small quantity exists:

A few laboratories are now working on...

We found a little oxidation after the process.

However, *without* "a" these expressions imply a far different meaning, not simply stating the existence of a small quantity but strongly stressing a significant lack:

Few laboratories are now working on...

We found little oxidation after the process.

The first example emphasizes that the number of such laboratories is extremely limited, while the second example emphasizes that the amount of oxidation is extremely small.

New—really opposite—meaning is given by the word *quite* before *a few* and *a bit of*:

Quite a few attempts have been made to...

This caused quite a bit of interference in the...

These expressions actually imply "many attempts" and "much interference."

The term *a lot of* works for both countable and uncountable objects, but its informality makes it appropriate only for background info in the Introduction, not for Methods or Results.

If used correctly, these "approximate quantifiers" can add *much* readability.

This or That? Make it clear!

A paper's Introduction section typically reviews the relevant previous work and then previews the work done in the current paper. Sometimes the transition between these two parts is not so clear. Consider this passage:

...was extensively investigated in an earlier work [13]. This paper approaches the speed–accuracy trade–off as an...

Here, it may not be clear to the reader whether "This paper" refers to the previous paper [13] or to *this one*. Clarify this by writing either "That paper approached the..." or "The current paper approaches the..." In other words, keep things clear by only using "this" for the current paper.

Mini Quiz: What's Wrong?

1) Both of the time and the frequency are...

2) Both of the parameters are...

(Answers: 1: delete "of"; 2: correct as is)

Author's Toolkit

Writing Better Technical Papers

Ron Read

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How something was done is extremely important in technical writing—the job for a verb. What something is like is also important—the job for an adjective. Put these two parts of speech together, and you get the very useful device we call a participle.

Participles: Verbs in New Jobs

The participle is, grammatically speaking, one of the three "verbals," the other two being the infinitive and the gerund. However, let's not get bogged down in technicalities. A participle basically takes a verb in its "-ed" (*past* participle) or "-ing" (*present* participle) form and uses it as an adjective:

The readers were *confused* by the...

Their argument was *confusing* because it...

In these examples, what look like common verbs actually modify the subject rather than express its action (a "regular" verb usage would be "Their argument confused the readers").

Past participles express a "passive voice" modification of a noun, while present participles express an "active voice" modification. A common-sense way to remember this distinction is that the past form ("~ed") indicates the "*receiver*" of the verbal's effect and the present form ("~ing") is the "*giver*" of it:

...and the sensor's housing was vibrated.

...and the sensor's housing was vibrating.

In the first example, the housing received the action of vibration, given by a researcher or some device designed to vibrate things. In the second example, the housing itself is giving the vibration, caused by some inherent property.

Another common-sense way to regard this distinction, between "~ed" and "~ing," is to consider the former the "experiencer" and the later "the experience":

We were fascinated by Nikola Tesla's lecture.

Nikola Tesla's lecture was fascinating.

In the first example, "we," the experiencers,

experience the fascination of the lecture; in the second example, Tesla's lecture itself was the experience that gave us fascination.

A simple case in conversation that often causes unintended meaning can be seen as follows.

I was bored at the party.

The party was boring.

These sentences clearly show the above experiencer/experience distinction. However, "The party was bored" would imply that the people there, called "the party," experienced boredom. "I was boring at the party" would imply that you caused boredom in others, who found you dull and uninteresting.

In technical writing, participles often act as adjectives directly in front of nouns:

The drilling tool was...

The drilled holes were...

As in the cases above, the tool does the action of drilling, while the holes receive this action.

That is, For example...

Two very common abbreviations in academic writing are "e.g." and "i.e." These are from Latin, (*exempli gratia* and *id est*) and they mean "For example" and "That is," respectively. The former gives typical instances and the latter gives a more specific—or more basic—restatement:

...of many factors, e.g., speed and direction.

...of the two factors, i.e., speed and direction.

As the above shows, these abbreviations have distinct meanings and are *not* interchangeable. American style places a comma after their final period, British style does not ("e.g. speed and"); the main thing is to be *consistent*.

Mini Quiz: What's Wrong?

1) This technique is called as the hidden...

2) This is the so called top-down ordering of...

(Answers: 1: "This technique is called the hidden..."; 2: "This is the so-called top-down...")

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Central to most published technical papers is an explanation of *how* something was done.

Adverbs: Telling *How*

The adverb is that basic part of speech used to modify a verb, an adjective, or another adverb; but most important is its modification of verbs, telling us *how* some action was done.

> x The signal propagated smooth toward...
>
> o The signal propagated *smoothly* toward ...

As the above shows, the most common way to make an adverb is to add "~ly" to the related adjective form. But there are some important exceptions to this pattern:

> o ... but it was *very* expensive.
>
> o ... but it was *too* expensive.

The basics of adverb use are explained very clearly in the book 技術英語の基盤 by my company's president, Francis J. Kurdyla. Here, let me touch on a few issues common to writers of technical documents in English.

Perhaps the most troublesome matter in using adverbs is their position in a sentence: Where should we put them? This is complicated by some "grammarians" applying old "rules" too broadly. For example, some textbooks tell us never to "split an infinitive" in this manner:

> ... is designed *to accurately detect* changes in...

But the above has much more **force** and **clarity** than the supposedly "proper" form:

> ... is designed *to detect accurately* changes in...

For such common "~ly" adverbs, we need to consider the "sound" and "feeling" of a sentence. If an expression does not require so much impact, placing the adverb after the verb is fine:

> o ... and was *monitored regularly* for 2 h.

A related common problem is the tendency to place an adverb far away from the word it modifies, generally at the end of the sentence:

> x ... designed to *detect* changes in... *accurately.*

As pointed out in the above textbook, "also" is a commonly used adverb in technical documents that is often mistakenly positioned. The following gives some simple rules of thumb.

1) After normal use of "be" (*is*/*are*/*was*/*were*):
> x *Also*, gaze direction was obtained by the...
>
> o Gaze direction was *also* obtained by the...

2) Before ordinary verbs in 'simple' tenses:
> x Gaze direction provides *also* a new way to...
>
> o Gaze direction *also* provides a new way to...

3) Before "be" in its 'root' form:
> x Gaze direction can be *also* considered a ...
>
> o Gaze direction can *also* be considered a...

4) After "have" in 'perfect' tenses:
> x Gaze direction has been *also* used for...
>
> o Gaze direction has *also* been used for...

These guidelines also apply to common adverbs like "still," "often," "just" and "already."

Finally, don't hyphenate after "~ly" adverbs:

> x ... adopted a biologically-inspired model for...
>
> o ... adopted a biologically inspired model for...

Unnecessary Instructions to "see"

When you refer your readers to a figure or table elsewhere in your paper, it really isn't necessary to use "see" in parentheses:

> x ... of both types were compared (see Table 2).
>
> o ... of both types were compared (Table 2).

This adds nothing: Readers know, from common sense, they should look there. Save "see" for cases where it might actually be useful, such as referring to another person's work:

> This approach has provided good results in the past (see Fig. 6 in Birnbaum [5]).

Remember: Simpler writing is better writing.

Mini Quiz: What's Wrong?

1) ... and this yielded product enough.

2) The training period was not enough long.

(Answers: 1: "yielded *enough product*" ("enough" works as an adjective); 2: "was not *long enough*" ("enough" works as an adverb))

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A very basic rule of English, as with many other languages, is that the sentence's subject and main verb must "agree in number."

Reaching Agreement

In the simplest sentences, the subject and the main verb are placed together, and thus correct verb agreement is relatively easy:

> o . . . This deviation *produces* an unreliable. . .

> o . . . These deviations *produce* an unreliable. . .

Verb agreement becomes a bit trickier when the subject and its verb are separated by a modifier of the subject, usually an "of" phrase:

> x A more tightly restricted set of variables and conditions were adopted to. . .

> o . . . and conditions *was* adopted to. . .

In such extended sentences, the best way to ensure correct verb agreement is to always identify the *actual* subject of the sentence ("set") and make sure the verb agrees ("was").

Some expressions require greater care in deciding the proper verb agreement. A common quantifying phrase in technical writing is "number of"; the verb agreement following such a phrase depends on your meaning. If you mean the specific **number** itself, use the article "the" and singular verb agreement:

> o *The* number of trials *was* increased to **four**.

On the other hand, if you mean an indefinite quantity like "several," use the article "a/an" and plural verb agreement:

> o *A* number of trials *were* run to verify our. . .

Expressions of "portion," very common in technical writing, also vary in verb agreement depending on meaning. These include fractions (two-thirds), percentages (85%), and certain phrases (e.g., "a majority of"). If you mean *a portion of a whole item,* use a singular verb:

> o Two-thirds of the chip *was* coated with SiN.

On the other hand, if you mean *a portion of in-dividual items making up a set* of such items, use a plural verb:

> o Two-thirds of the chips *were* defective.

Be careful to use a singular verb for "each":

> x Each of the devices are coated with. . .

> o Each of the devices *is* coated with. . .

In using "either/or" or "neither/nor," match the verb with each of the two items, not both; when the items are 'mixed' between singular and plural, match the verb to the closest item:

> o Either Al or Au *is* a suitable material for. . .

> o Neither ellipses nor circles *are* found in. . .

> o Either the base or the nodes *need* to be. . .

Verb agreement "isn't rocket science," but please consider it in your proofreading, especially with long, complicated sentences.

Linking to "above"

Authors often refer to something mentioned earlier ("above") in the paper. For example:

> We then implemented a modified algorithm by applying the above parameters.

Here, you don't need to use "the above-mentioned." If an idea is above, of course it is "mentioned," not sung or painted. If you're referring to something just one or two sentences above, an even simpler expression can be used:

> We then implemented a modified algorithm by applying these parameters.

Avoid using expressions like

> x . . . by applying the previous parameters.

This could mislead the reader, giving the idea that you're referring to an earlier paper. If you refer to something "way above," be specific:

> o . . . the parameters given in subsection 3.2.

Mini Quiz: What's Wrong?

1) . . . and same settings were used for sample 2.

2) A same result was obtained after sintering.

(Answers: 1: "*the same*"; 2: "*The same*")

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In English, we have two main ways of writing each alphabetic character: uppercase, or 'capital' ("A"), and lowercase ("a"). This distinction, of course, is not used randomly but to imply a particular meaning.

Capitalizing Correctly

A good place to start with capitalization basics is the rule to always capitalize the first word of a sentence. ~~this~~ This is simple enough to follow but sometimes neglected in submissions.

Capitalization of abbreviations can be a bit troublesome: They may be fully capitalized, as in DNA (dioxyribose nucleic acid) or A (ampere), fully lowercase, as in mm (millimeter) or dc (direct current), or mixed, as in MHz (megahertz) or kW h (Kilowatt hour). Consult a reliable source like the Style Manual of the American Institute of Physics.

After a colon (:) you should not capitalize the next word if it only starts a series of words or phrases (e.g., "... into three major categories: inert, volatile, and unknown."). If the next word begins one full sentence, you *can* capitalize this word, but it's *not* necessary; however, if a series of two or more full sentences follows the colon, the word beginning each sentence *must* be capitalized.

A common error in technical writing is to capitalize generally used methods/devices:

x ... a Scanning Electron Microscope (SEM).
o ... a scanning electron microscope (SEM).

Similar to this error, an author should not mistakenly capitalize words simply because he or she thinks they're "important":

x These results demonstrate the superiority of the Proposed Method. (o proposed method)

The words of a paper's title are generally all capitalized except for articles ("a/an," "the") and prepositions ("of," "between," "in," etc.). However, some journals use different capitalization rules.

Proper names (J. J. Jones) and words made from proper names (Gaussian) are capitalized, though not always as units of measurement (77 ohms). Capitalize organizations' names fully:

x of the Umeboshi Advanced Research center
o of the Umeboshi Advanced Research Center

In your e-mail correspondence, you should definitely avoid writing messages in all-capital letters: THIS IS CALLED SHOUTING, AND IT WILL PROBABLY ANNOY YOUR READERS AND NOT GAIN YOU FRIENDS.

Making errors in capitalization is not a 'capital crime' (i.e., punishable by death), but it will decrease the readability of your paper.

Authorship: Don't Overuse "etc."

The little abbreviation "etc." for the Latin *et cetera*, meaning "and other such things," can be very handy in technical writing, but it's often overused. The most common wrong use is at the end of a "such as" expression. For example:

... involves many factors, such as node density, signal strength, network topology, etc.

This is clearly illogical because "such as" itself introduces a *partial* series of like things. Better:

... involves many factors, such as node density, signal strength, and network topology.

Another misuse is when the intended meaning of "etc." may not be clear to all readers:

x ... returned images of Apollo, Hidalgo, etc.
o ... returned images of Apollo, Hidalgo, and other asteroids.

Finally, using "etc." too frequently can hurt the natural flow of your writing.

Mini Quiz: What's Wrong?

1) ... and then searches the lowest point.
2) ... and then searches the parameter space.
(Answers: 1) *searches for*　2) no problem)

Author's Toolkit
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In information science, the use of representational entities, such as symbols, icons, and proxies, has become increasingly important. In English writing, a similar useful device is the pronoun, a word that stands as an "icon" for another word in the text.

Pronoun Power

Just as a small icon on your computer screen can indicate and, if selected, activate a huge application or file, a small word like "it," "this," "they," or "these" can indicate, and activate in the reader's mind, a big word or group of words.

These words are very common in English writing, but it's easy to underestimate how powerful they can be in linking ideas and thus producing a clearer document.

Consider this example:

> Autonomous *ad hoc* error recovery is an effective approach for ensuring uninterrupted service where human supervision is not practical. Autonomous *ad hoc* error recovery can also improve load balancing in. . . .

Now, these two sentences are basically clear and easy to follow. However, if the document is complicated, or the reader is sleepy, the connection between the sentences' same subject may be broken, thus decreasing the paragraph's cohesion. On the other hand, if we use

> . . . is not practical. It can also improve. . .

then the reader *must* connect the two sentences because there is no real thing called "it"; an inattentive reader will wonder "Oh, what is 'it'?"

A special type of pronoun, the demonstrative pronoun, can be very useful:

> . . . can be used with a wide variety of materials. *These* include manganese, bauxite, and. . . .

A similarly useful tool when more clarity is required is the demonstrative adjective ("*These materials* include. . .").

Pronouns are easy to use, but some care must be taken: The connection between the pronoun and the indicated word(s) ("antecedent") must be clear. For example, "it" is unclear in

> The framework of the new model is based on a motion-detection tool. It uses advanced technology developed in our lab recently.

Here, clarify your meaning by writing, "This framework uses" or "This tool uses."

As a general rule, use "it" for a specific thing but "this" for a *general situation*. For example,

> . . . but such a technique can degrade the demodulation. It means that we need to find a way to control excessive. . .

would be clearer and more natural as "demodulation. This means that we need to. . ."

Although the "pro" in "pronoun" actually means "for" from Latin ('for a noun'), if you use pronouns well you'll start writing like a Pro!

Authorship: "Respectively" Series

The word "respectively" is useful for showing the parallel relationships between objects in two series. For example:

> The results for samples A, B and C were 6.5, 3.5 and 4.7, respectively.

However, this word is often misused. For example, when there are no parallel series:

> x Our results showed that A was 6.5, B was 3.5, and C was 4.7, respectively.

Or when the meaning is obvious without it:

> x The second and third phases begin 3 and 10 minutes after the first phase, respectively.

Make sure you respect "respectively" by using it correctly and usefully.

Mini Quiz: What's Wrong?

1) This process is important and necessary for. . .
2) They are combined together to form a. . .
(Answers: *either* "important" *or* "necessary," depending on your meaning; delete "together")

Author's Toolkit
Writing Better Technical Papers

Ron Read
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It was a great pleasure in March to meet many IEICE members at the General Conference in Kitakyushu. In this issue's Toolkit, let's look at an easy but very effective technique for keeping your sentences clear.

Keep the Main Verb *Early*

English is a very "action-oriented" language, and since verbs are the grammatical tools mainly used to express action, it's logical to think of the verb as the "captain" of a sentence.

A reader of technical writing—or a listener to a presentation—does not want to be kept waiting for the main verb; he or she wants to know soon "what's happening, where's the action here?"

In fact, delaying the main idea (expressed by the main verb) of any sentence, through the intervention of phrases giving supporting ideas, which may or may not be critical, or other ideas secondary to the sentence's main idea, **will frustrate** any reader. Wasn't that last sentence just too tough to read? Try this: "In fact, any reader will become frustrated if you delay the main idea by using intervening phrases that..."

Here's a more typical example:

Biometric approaches, which encompass a wide variety of technologies, including face recognition, iris scanning, voice analysis, fingerprint matching, and brainwave energies, exploit human characteristics to achieve system security.

The sentence's subject, 'biometric approaches,' is separated from the main verb phrase, 'exploit human characteristics,' by a long series of noun phrase made from technical terms, in this case examples.

This very typical writing problem can be solved easily by completing the main verb soon and then listing the examples:

Biometric approaches exploit human charac-teristics to achieve system security. Such approaches apply a wide variety of technologies, including face recognition, iris scanning, voice analysis, fingerprint matching, and brainwave energies.

The basic principle: Don't make your readers search too hard to find your ideas.

Authorship: Previous Work

Of course the ideas behind your research did not emerge fully whole from your brain, despite how rich your imagination may be; you considered and then extended, modified, or disproved work that came before your own. How you discuss this previous work in your paper is an important issue.

In citing related and foundational works, strike a balance between *not* neglecting key sources and *not* exhaustively listing every slightly relevant paper. Just enough to show the core body of major supporting works, attempts that conflict with yours, and research that inspired you.

It's better style not to use reference numbers alone as grammatical elements in sentences. For example:

[6] also emphasized the influence of...

is better as

Herrera [6] also emphasized the influence of...

or

Previous works [6], [7], [11] also emphasized the influence of...

Discussion of previous works belongs in the Introduction section; the Summary (Abstract) and Conclusions sections should discuss *only your own work* done for *this* paper.

Mini Quiz: What's Wrong?

1) This step is strongly required for...
2) This calculation is very critical to...
(Answers: Delete *strongly* and *very*)

Author's Toolkit

Writing Better Technical Papers

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In this issue's Toolkit, we consider the sometimes tricky but usually simple issue of when to use "-" in technical writing.

Some Basics of Hyphen Use

In the many works on English usage, you can find a huge number of rules and guidelines for hyphenation. In this limited space, however, we'll look at just a few that most commonly cause problems for writers of technical papers.

The most common uses of the hyphen are joining words in a compound noun ("we reached the *cut-off* at...") and making compound modifiers of nouns ("a *cross-sectional* view"); actually, the latter use is the most typical hyphenation found in technical writing.

A warning: There is not always universal agreement on hyphenation guidelines; some publications do not use a hyphen in my example of "cross-sectional."

Let me jump right into the most common hyphen problem in submissions to IEICE: expressing "real time." Fortunately, this has a simple solution. When these two words modify a separate noun, hyphenate as

... was measured under *real-time* conditions.

Here, "real" and "time" **together** modify "conditions"; we do not mean "real conditions" plus "time conditions." But when "time" is the main noun, simply modified by "real," write

... and it was measured in *real time*.

The same principle applies to other common expressions:

A *large-scale* implementation was needed to... but

... and it had to be implemented on a *large scale*.

This usage principle is important for expressing combinations of values and measurement units, a very common writing job in technical documents. Accordingly, we write

... using a 60-MHz transmission.
... was transmitted at 60 MHz.

A usage that sometimes turns tricky is "abc-based." This is simple with one word: "a *quantum-based* approach." But when the modifier before "based" is itself a combination, thus requiring three hyphens, *some* writers feel that this type of expression is awkward:

... used a quantum-theory-based approach.

In journalistic writing, this is sometimes simplified in a common-sense manner by inserting a hyphen only before "based":

... a New York-based writer.

However, given the precision demanded by technical writing, the expression "a quantum theory-based approach" does not logically match the intended meaning. In some cases, you can just eliminate "based": "a quantum-theory approach" is perfectly clear. As always, regardless of the usage decision you make, be consistent throughout your paper.

Finally, never hyphenate normal "ly" adverbs (bad: "parameters were *manually-tuned*") or compounds like "database" that have become conventional as one word (bad: "*data-base*").

Authorship: Parentheses

Parentheses are very handy tools for adding information without breaking a sentence's flow. However, remember to *always* insert a space *outside* a parenthesis and to *never* insert one *inside* it. **Wrong**: "...formula(TBF) was used to..."; **Right**: "...formula (TBF) was used to...." Also, avoid *unneeded* explanation like "...formula (*abbreviated as* TBF)."

Mini Quiz: What's Wrong?

1) Containment has been also studied for...
2) ...is considered as effective for...
(Answers: *has also been; considered effective*)

Author's Toolkit

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In this issue's Toolkit, we consider perhaps the trickiest and most frustrating feature of English to non-native writers of the language: articles ("the," "a," "an," "*no article*").

"The," "a/an," or nothing?

The choice of which, if any, article to use is based not on ironclad rules but on general guidelines and conventional usage.

The most basic guideline determining article usage is whether the corresponding noun is a newly introduced/non-specified thing or a previously introduced/identified thing. For example, in first mentioning something write:

...was measured using **a** high-quality filter.

But for later references to the same thing write:

We calibrated **the** filter by...

Always use the *definite* article (the) for unique things modified by a superlative or an ordinal number. For example:

...was the most effective solution.

...and provides the best protection against...

The third layer is used for...

Use the *indefinite* article (a/an) only for countable nouns, like "circuit" or "node"; therefore, never write "an information" or "an equipment." Non-countable nouns take no indefinite article or are modified in such ways as "some information" or "a piece of equipment."

In some special cases, no article is used when it would seem logical to use one. A typical example of this in technical writing involves expressions that indicate qualitative changes:

...increased detection performance by 17%.

...improved resistance by 17%.

A simple guideline for choosing "the" is to look for "of" after the modified noun, indicating that it identifies or relates to a particular thing:

...to determine *the* stochasticity *of* Set B.

In *the* center *of* this circle, we drew a...

Sometimes, article choice is made tricky by sentence structure:

An average increase of 17% was obtained by...

But:

The average increase obtained by...was 17%.

Using articles smoothly takes a certain 'feel' as much as adherence to rules. By gaining experience through reading technical English, you will slowly, but surely, develop this feeling.

Authorship: Balance Your Content

Most technical reports justify the premises of their approach by citing previous work. However, this should not take up too much space in the Abstract (Summary) or Introduction: Most of the content here should be on *your* current work! Also, previous work should not be mentioned in the Conclusions.

Mini Quiz: What's Wrong?

1) Besides, it should be noted that...

2) In addition to that, we...

(Answers: *Furthermore, it: In addition, we*)

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In this issue's Toolkit, we take up the comma (,), a very important internal punctuation mark. If used properly, it guides your reader toward effortless understanding of your ideas; if used improperly, it leads your reader to confusion.

The Comma:
A Bit Tricky but *Important* !

The comma serves several functions, but let's focus on three of its most important jobs: dividing items in a series, marking parenthetical comments, and separating clauses.

More than two items listed in a series are separated by commas. A longstanding "debate" among some grammarians is whether to place a comma before "and" and the final item. My own *rough* guideline is rather simple. Don't add it for items that are words or very short phrases:

> We measured the signal's duration, *amplitude and* direction of arrival.

But insert the comma for longer items:

> This process involves three steps: detecting occurrences of interference, analyzing interference *patterns, and* constructing a routing grid.

Commas also set off "by the way" expressions, in the manner of dashes or parentheses:

> The results show that GaAs, which has a lower density, does not cause such problems.

This is actually called "a pair of commas," so be sure to remember both the front comma and the back comma.

One of the most common sources of error I've found in rewriting and evaluating technical papers is the function of separating clauses.

First, there should not be a comma between a subject and a related verb (unless a parenthetical expression is inserted or there is a series of more than two verbs). Accordingly, the comma in this sentence is incorrect and should be deleted:

> x Our approach offers the advantage of non-contact cancer *detection, and* thus provides a safe alternative to invasive surgery.

In the case of long verb phrases, you can add a "breather" comma and still maintain good grammar by using a *pronoun*:

> Our approach offers the advantage of non-contact cancer *detection, and thus it* provides a safe alternative to invasive surgery.

Second, a comma needs to be inserted between clauses:

> x Many attempts have been made to solve this problem but none of the solutions proposed so far is satisfactory.

Here, a clause-dividing comma should be added as "problem, but none...."

Finally, remember that commas follow certain rules and are not just added to text randomly.

Authorship Strategy:
Don't use "researches" as a noun!

As a noun, the word "research" is collective, or non-countable. Therefore, don't write "many researches" but "much research." The countable usage is rather old-fashioned and odd, a direct application of its French root "recherches." If you do need to quantify, add a countable word: "Several research efforts have..." or "Three previous research projects found...." Related to this issue, avoid "evidences": "These results provide sufficient evidence that...."

Mini Quiz

What's **wrong** with these sentences?
1) *To clear this mechanism, we...*
2) *It is inserted between both nodes...*
3) *We can not yet determine whether...*
(Answers: *clarify, between the two, cannot*)

Author's Toolkit
Writing Better Technical Papers

Ron Read
Kurdyla and Associates Co., Ltd.

In this issue's Toolkit, we'll discuss the important concept of "parallelism" in technical writing and how an understanding of this concept will improve your documents.

Writing Principle:
Maintain *Parallelism*!

A common analogy to help pupils understand the concept of "parallel" in geometry class is the image of train tracks, two lines disappearing into the horizon in unvarying lockstep. Your ideas in a document should move together toward the reader's understanding, and thus the words expressing those ideas should have *parallelism.*

At a basic level, parallelism means using the *same grammatical structures* throughout a sentence. For example:

> We increased efficiency by adopting a simpler codec and through a greater number of nodes.

This sentence is grammatically OK and understandable with a bit of effort, but the mixed-up structure of "by + (verb)ing" and "through + noun phrase" can be easily improved to a more parallel and clearer sentence:

> We increased efficiency by adopting a simpler codec and increasing the number of nodes.

Another common problem of parallelism is *faulty construction of a series*, particularly with multiple verbs. Consider this sentence:

> We achieved this by limiting exposure time, applied voltage, and installing a gas barrier.

Due to the poor matching of verbs and objects, this sentence is going to frustrate even the most careful reader. This is what the writer means:

> We achieved this by limiting exposure time and applied voltage and by installing a gas barrier.

(Note that in the first correction "by" isn't repeated because the intention is very clear; in the second correction we repeat "by" because it's a bit far from "achieved.")

A third common problem of parallelism is awkward (and easily avoidable) *mixing of active-voice and passive-voice* clauses:

> The conventional method monitors all incoming packets, while in the proposed method only tagged packets are monitored.

This can be easily simplified to:

> The conventional method monitors all incoming packets, while the proposed method monitors only tagged packets.

Some people love mystery stories for the excitement of guessing. Others like *avant-garde* novels for the challenge of strange literary forms. But I've never heard of anyone reading a technical document with the hope of becoming confused— keep your reader "on track."

Authorship Strategy:
Introduce Abbreviations Properly!

Abbreviations are very handy for expressions that are long, used often in your paper, or well known in your field. However, they should be written out in full form at least once in the abstract and once in the introduction, and first mention in the conclusions is helpful. Introduce the full expression first and then the abbreviation in parentheses: "We used a medium access control (MAC) protocol for..." *not* "We used a MAC (medium access control) protocol for...."

Mini Quiz

What's **wrong** with these sentences?
1) *This threshold constraints overcharging by...*
2) *We implemented additional constrains to...*
3) *Overlapping of signals was constrained by...*
(Answers: *constrains, constraints,* no problem)

Author's Toolkit
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In this issue's Toolkit, let's consider the critical factor of *logical continuity* in technical papers. This is the "invisible glue" that keeps an article from falling apart into senseless pieces.

Writing Principle:
Maintain *logical continuity*!

More than 30 years ago, my boss, Frank Kurdyla, incorporated the concept of "logical continuity" in our seminar programs for both technical and business writing. In a nutshell, this concept involves "guiding the reader's mind" so that he or she "gets" the ideas you want to give.

I like to think of any document as a "story" that should have cohesion, an inherent sense of unity in its message. All of us have suffered through books and movies that have exciting bits but that just don't "stick together." In a technical paper, two basic and powerful tools for achieving unity are *organization* and *transitions*.

Organization: Business writing has a variety of strategies for ordering ideas: problem/solution, chronological, etc. Technical Writing is more straightforward: the first level of organization is sectional, the second is sequential, and a *possible* third is significance.

Sectional simply requires a traditional division of presented information: Abstract, Introduction, Methods, Results, Conclusions, and sometimes other sections. These sections should contain only their proper information, maintain internal unity, and show consistency with each other. Within the sections, information is presented *sequentially*, the order in which work was done or results were obtained: first, next, then, etc. Finally, if some procedures, results, or conclusions are independent of sequence, they should be presented in order of *significance*: placing the most important ideas first.

Transitions: Showing your reader clearly the connections between ideas greatly helps in guiding his or her attention to your intended message. Consider the following two sentences:

> Several advantages can be gained by adopting multi-hop signal propagation. Such an approach requires a more precise routing algorithm.

Both sentences are grammatically sound and clear, but the reader must mentally recreate a crucial message, i.e. the two ideas present a contradiction or trade-off relationship. We can help the reader's thinking toward this important point with the simple addition of one word:

> Several advantages can be gained by adopting multi-hop signal propagation. **However**, such an approach requires a more precise routing algorithm.

In this second version, "However" plays a strong role in conveying the "meta-message" that we have to resolve two conflicting concepts. Transitions will be covered more extensively in a future Toolkit.

Authorship Strategy:
Position figures strategically!

Where you *place figures* in your paper directly affects logical continuity. If a reader suddenly sees a figure with no relation to what he or she has read so far, this reader's attention will be unnecessarily disturbed. Place figures just a bit after the first time they are mentioned in the text.

Mini Quiz

What's **wrong** with these sentences?
1) *Even the error rate decreased, it still...*
2) *Even we reduced the errors, they would still...*
3) *Even low-power nodes can benefit from...*
(Answers: even *though*, even *if*, and no problem)

Author's Toolkit
Writing Better Technical Papers

Ron Read
Kurdyla and Associates Co., Ltd.

In this issue's Toolkit, we take up a language topic that often frustrates writers of technical papers in English: verb tenses.

Writing Principle:
Use the right *verb tense* !

Each language has it s own way of indicating the *time* of when an action happened or a state existed. Sometimes this is done with words or phrases ("next week," "yesterday," "five years ago"), but mostly it's done with verb tenses ("write/writing/wrote/has written/will write"). I can still recall struggling with tenses in my high school French class, especially for irregular verbs! Let's look at the *parts of technical papers* where tense usage is important.

Abstract (Summary): Some of my clients have suffered much stress about tense use in this very important part of the paper. Actually, there isn't universal agreement here. Traditionally, abstracts have been written in the *present*: "In this work, we **modify** the conventional Griffley-Hines algorithm by setting ...." This makes sense to me, since the abstract should describe "what the paper says" rather than "what the authors did." However, several fine publications allow use of the *simple past* here ("... we **modified** the ..."). As general rules of thumb, 1) follow the guidelines of the publication, if any, 2) use the tense that best fits the content, and 3) be clear and consistent in using verb tense in the abstract.

Introduction: In describing what *you did* in the work, the *simple past* is usually best: "We then switched the parameters to ...." In describing *background* or *related works*, there are two general situations. First, use the *present perfect* to describe works done by different researchers over a time range: "Many researchers **have studied** the segmentation of boundary patterns ...." Second, use the *simple past* for work done by a particular researcher/team at a specific time: "Later, Glibdar et al. **developed** a quicker HMM-based parser for...." Also, it's not necessary to use the *future* to preview sections ("In Section 3 we **will describe** the ..."); just use the *present* ("In Section 3 we **describe** the...").

Methods, Results, and other body sections: Use common sense and be consistent. However, don't be too strict about consistency: A general action might be best in the *simple past* ("We *used* the same process for the ..."); on the other hand, the specific steps of a procedure might be best in the *imperative mood* ("Step 3. **Remove** the aberrations by filtering the ...").

Conclusions: Use the *simple past* to describe what you *did in the paper* ("In this paper, we **proposed** a ..."), not the *present perfect* ("... we **have proposed** a ..."). In describing *future work*, it's logical to use either the *future* ("Future work **will include** ...") or the *present* ("Future work **includes** ..."). Take your choice.

Authorship Strategy:

Keep your *abstract* lean and mean!

An abstract/summary should give a brief and clear *snapshot* of the full paper: work pursued, methods used, main results obtained, and significance of the new knowledge. It should *not* contain background information, related works, or any references to figures/equations. Also, don't "tease" your readers by withholding key info: the abstract is not a mystery story!

Mini Quiz

What's **wrong** with these sentences?
1) ... *at the rate of 16 beats per a second.*
2) ... *and it influences on the propagation rate.*
3) *For the purpose of comparison, we also ...*

(Answers: delete *a, on,* and *the purpose of*)

Author's Toolkit
Writing Better Technical Papers

Ron Read
Kurdyla and Associates Co., Ltd.

Welcome to the first "Author's Toolkit." In these articles, I hope to give some practical advice that you can put to immediate use in writing better technical papers in English.

Writing Principle:
Keep Sentences Short!

My work involves technical rewriting, training technical rewriters, and evaluating the writing of articles submitted to IEICE D Group; previously, I worked as a radio/newspaper editor and reporter. After doing such work for more than 25 years, what's the biggest problem I've noticed among Japanese and other non-native writers of technical English? Writing sentences that are too long.

Many years ago, my company's founder and president, Francis J. Kurdyla, told me that some Japanese managers and researchers consider the use of long sentences an indicator of "sophistication." In technical writing, this bias can certainly lead to trouble! Long sentences mentally exhaust the reader, provide more opportunities for error and ambiguity, and bury your ideas in your words. Not a good approach.

Always remember that your primary job as an author is to make the reader's job **easy**. A truly sophisticated sentence in technical English is one that conveys your ideas smoothly to your reader.

Consider the following extreme example:

Many new technologies have been introduced in recent year to resolve the long-standing problem of robots killing their owners, a problem which occurs when robot owners use abusive language with models that are overly sensitive due to faulty programming by designers as well as unsuccessful

implementation of highly advanced emotion sensors, which requires extensive knowledge of interpersonal psychology.

Whew! That **can** be understood with effort, but why be so mean to your readers? Consider the following revision, broken into bite-sized bits:

Many new technologies have been introduced in recent year to resolve the long-standing problem of robots killing their owners. This occurs in reaction to abusive language with models that are overly sensitive due to faulty programming by designers. A further problem is unsuccessful implementation of highly advanced emotion sensors, a task that requires extensive knowledge of interpersonal psychology.

Isn't that a bit easier?

Authorship Strategy:
Watch the Hotspots!

Related to avoiding long sentences, there are certain locations in a technical paper that demand EXTRA care in writing clear, simple, and short sentences. These are the first and last sentences of the Abstract/Summary, the first sentence of the Introduction, and the first/last sentences of the Conclusions. In addition to these, take care with the first/last sentences of major sections like Methods and Results.

These hotspots are critical for guiding the reader and clarifying your key ideas.

Mini Quiz

What's **wrong** with these sentences?
1) *... then the signal enters into the node.*
2) *... then the signal leaves from the node.*
3) *This network configuration is very unique.*

(Answers: delete *into*, *from*, and *very*)